THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The week has emphasized the differing conditions of the Bessemer and open-hearth departments of the steel trade. Increasing competition in sheets and wire products has led to reductions in price, and similar conditions in the tin plate trade are expected to be met by similar action. It is not that consumption of these products has fallen off—except that in tin plate the decreased canning demand has been the chief factor. The increase of capacity beyond the needs of the country, even in this record year, has been an accumulating influence that required to be reckoned with sooner or later. The cut of $5 in the price of light sheets puts to the test the ability of mills buying their steel in the open market, to compete with concerns that are grounded in ore and fuel. Announcement is made that one idle mill of the American Sheet Steel Co. will start up next week and that one or two others will probably follow. In the wire trade the reduction is $2 on nails and smooth wire and $7 on barb wire. Here also the pressure of growing capacity is being felt, though the demand is quite up to expectations for the season. The export trade will be increasingly resorted to as a safety valve. In wrought pipe there are also evidences in recent concessions in price, that the ranks of producers have been filling up. The week has brought no sign that general conditions governing the consumption of iron and steel have changed for the worse, except such as grow out of the uneasiness felt over the effects of the anthracite strike. It is apparent that manufacturing operations will be crippled if the strike is not soon ended, and that blast furnaces and foundries will have plenty of company in fuel hardships. The coke situation has not improved. Foundries are being saved from serious loss by the foreign pig iron that is now coming freely, but many blast furnaces are worse off than for weeks. In the Mahoning and Shenango Valleys eight are reported banked this week. The leading producer of Connellsville coke has not yet made sales to blast furnaces for next year, but the price is expected to be close to $3 at the ovens. That there will not be as large a supply for the market from this source as heretofore seems probable, and furnacemen will depend increasingly on the West Virginia fields. Concerning the policy of the United States Steel Corporation respecting the sale of raw materials we have from an officer of the corporation information to this effect: The corporation is building additional blast furnaces and has others in contemplation. It will be necessary to curtail sales to outsiders, to supply the corporation's additional requirements without increasing the rate of exhaustion of its mineral reserves. The strength of the corporation being primarily in the abundance of its raw materials, it is the purpose to conserve such material for its own use to the utmost. While sales of coke will not be discontinued they will be restricted. In the past week there have been bought 50,000 tons of Bessemer iron by steel works outside the steel corporation. Deliveries are spread over the first half of 1903 and prices were $21.50 to $21.75 at Valley furnace. For the first quarter $22 at furnace is paid. There has been no change in the foundry iron market and buying for 1903 is light, though prices are firmer, those for the first half of 1903 approximating quotations for 1902 iron. The demand for foreign steel has halted pending the final decision on the action of the Philadelphia customs officials in assessing the duty on German steel on the market price of the steel in Germany instead of the declared value. If this is sustained it will mean, as pointed out elsewhere, considerable losses to importers and probably the cessation of imports. In finished material the strength in open-hearth steel products is still conspicuous. The plate requirements of the Pressed Steel Car Co. will be 150,000 tons more next year than for this—a fact of great significance to plate manufacturers. Chicago reports several thousand tons of plates sold the past week, 12,000 tons of structural shapes and 10,000 tons of bar iron for car works. Rail contracts include 15,000 tons at Pittsburg for the Pittsburg & Lake Erie and a 10,000-ton order at Chicago. Of a recent 4,000-ton order for China, an American mill was able to take 1,000 tons under the conditions imposed as to delivery.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, Oct 8.

No less than eight furnaces are banked today in the Mahoning and Shenango Valleys and unless deliveries of coke improve several stacks will be added to this already long list. Deliveries of coke fell off to an alarming extent the latter part of last week and on Saturday the first of the furnaces in operation was compelled to bank. Additional stacks were added to the list on Sunday and the number was further augmented on Monday. The stacks in operation are in danger of being banked at almost any time and the coke situation from the Valley furnacemen's standpoint is again very serious. Rather than pay the exorbitant prices asked for coke for immediate shipment, a number of the operators concluded that banking would be the more profitable. The settlement of the miner's strike in West Virginia will shortly result in starting up many coking plants that were compelled to shut down months ago on account of the strike. This will relieve the coke situation to some extent and it is probable that orders will be placed with West Virginia operators for at least a portion of the coke requirements of the Valley furnaces for the remainder of the year.

The pig iron market was very active during the past week, sales of nearly 50,000 tons of Bessemer iron having beeen made to independent steel producers by Valley furnaces for deliveries extending through the second quarter of next year. Contracts for the second quarter were closed on a basis of $21.50 to $21.75 at the furnace, while deliveries through the first quarter only were made on a basis of $22 per ton. Small lots for delivery the remainder of the year were placed at prices ranging from $22.50 to $22.75 at the furnace. These are by far the highest prices paid for Bessemer iron since the memorable boom in 1899 and in some quarters grave fears are expressed that the market will react owing to the cuts already announced in some of the finished lines and which will no doubt be followed by similar reductions in at least two additional finished lines.

The reduction in the price of sheets is being met by some of the independent mills, although those not having their own source of steel supply can realize practically nothing with sheet bars at present prices. The cut on galvanized sheets on the other hand is not nearly so severe and this is being readily met by independent mills. The reductions announced in the wire trade were being met by the independent mills before they were announced by the American Steel & Wire Co., and despite the very slight differential which exists between wire rods and the finished products, many of the independent mills buying their rods in the open market are taking business at the announced prices.

In the heavier lines the market continues exceptionally strong. A meeting of the plate association will be held in New York on Thursday, but it is extremely doubtful if anything will be done that will affect present prices. All of the

mills are securing from $5 to $8 per ton above agreement quotations and the leading interests consider it a wise move to make no change whatever in the agreed basis. The Pressed Steel Car Co., according to its agreement with the Carnegie Steel Co., receives 1,000 tons of plates per day. Owing to additions that are now being made to the car plant the output will be materially increased, and the monthly requirements of plates will be increased to about 40,000 tons. This is an increase of about 150,000 tons per year.

There has been no buying of foreign steel in this market during the week, and there will be no additional buying until the action of the Philadelphia appraiser who last week marked up a consignment of slabs will be finally passed upon. Local concerns that recently placed orders for steel with German mills are very much exercised over the decision, as it means that they will be compelled to pay $2.24 per ton more for steel.

PIG IRON.—Sales of Bessemer iron aggregating 50,000 tons were made by Valley furnaces to independent steel interests during the past week. The iron for delivery the remainder of this year was sold on a basis of $22.50 to $22.75 at the furnace, while deliveries the first quarter of next year were made on a basis of $22 at the furnace. For delivery the second quarter the iron was sold at $21.50 to $21.75 at the furnace. The Valley furnaces have again been compelled to bank on account of the failure of the coke supply and the deliveries thus far this week have been no improvement. We note the sale of 1,500 tons of forge iron for delivery the remainder of this year at $21.75, Pittsburg, and the sale of 5,000 tons for delivery the first quarter of next year at $21, Pittsburg. Foundry iron for delivery the remainder of this year, No. 2, is quoted at $23.50 to $24, while deliveries the first half of next year are now held at $22.50. We revise quotations as follows:

Bessemer, Valley	$21 50 to 22 75
Bessemer, Pittsburg	22 25 to 23 50
No. 1 Foundry	23 50 to 24 00
No. 2 Foundry	22 75 to 23 25
No. 3 Foundry	22 25 to 22 50
Gray Forge, Pittsburg	21 50 to 21 75
Chilled Basic, Valley	20 75 to 21 00
Chilled Basic, Pittsburg	21 50 to 21 75

STEEL.—The market continues quiet, with no buying of foreign steel and very little buying of domestic. Domestic open-hearth billets are held at $33 and Bessemer at $31. Rods are quoted at $36 at mill, Pittsburg, with a tendency toward lower figures.

SPELTER.—The market continues practically stationery and we quote prime western grades at 4.35c to 4.37½c, Pittsburg.

FERRO-MANGANESE.—German ferro is being offered at $51 to $51.25 for 80 percent. No domestic manganese is being placed on the market.

MUCK BAR.—The market continues quiet and local mills are holding their product at $36 per ton. Eastern mills are offering a considerable tonnage, however, at $35, but there is little buying.

SKELP.—The demand for both iron and steel skelp continues very quiet and we quote grooved and sheared iron skelp at 2c to 2.05c and steel skelp at 2.10c to 2.15c.

RAILS AND TRACK MATERIAL.—The Pittsburg & Lake Erie Railroad Co. placed an order with the Carnegie Steel Co. this week for 15,000 tons of rails for delivery next year. Quotations remain unchanged as follows: Standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $44; 12 pounds, $43; 16 pounds, $41; 20 pounds, $40; 25 to 40 pounds, $38 to $39. Track materials: Spikes, 2c to 2.05c; track bolts, square heads, 2.50c; hexagon heads, 2.65c; fish plates, 1.60c.

PLATES.—A meeting of the plate manufacturers will be held in New York on Thursday, but it is not probable that agreement quotations will be changed. At present local mills are securing 1.85c on nearly all their business and Eastern mills are asking as high as 2c. Additions that are being made to the plant of the Pressed Steel Car Co. will result in an increased consumption of plates by that concern next year amounting to 150,000 tons. At present the company's contract with the Carnegie Steel Co. calls for the daily delivery of 1,000 tons. As yet the contract for the additional capacity has not been placed. Agreement quotations are as follws: Tank plates, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plate more than 100 inches wide, 5c extra 100 pounds. Plate 3-16 of an inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

STRUCTURAL MATERIAL.—The market continues very firm and as high as 2c continues to be paid on round lots of heavy material for prompt delivery. Agreement quotations are unchanged as follows: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 6 inches, 1.60c; universal mill plates, 1.60c.

BARS.—The steel bar market is now in a very satisfactory condition and all of the local mills are operating at their fullest capacity. In iron bars the Pittsburg base of 1.80c is being firmly maintained and the demand is reported very good. We make the following quotations. Bessemer steel bars, 1.60c; open-hearth, 1.70; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer under 3 inches, 1.70c; over 3 inches, 1.80c; bar iron, 1.80c to 1.90c, Pittsburg, with full freight added to point of delivery. Hoops and bands are quoted at 1.90c, full extras, in 250-ton lots and over, and 2c in less than 250-ton lots; refined iron bars, 2.25c and upwards.

PIPES AND TUBES.—The volume of business that continues to be placed is exceedingly heavy but concessions continue to be made by independent mills on all grades of pipe except boiler tubing. Reductions as high as 10 per cent have been reported. Quotations to jobbers in carload lots, with freight added to destination, are as follows:

MERCHANT PIPE.

	Black Percent.	Galv. Percent.
⅛ to ⅜ and 11 to 12 inches	60	48
¼ to 12 inches	67	55

BOILER TUBES.

Steel.

	Percent.
1 to 1½ inches	45
2¼ to 5 inches	62½
1¼ to 2¼ and 6 to 13 inches	52½

Iron.

	Percent.
1 to 1½ inches	42½
2¼ to 5 inches	50
1¼ to 2¼ and 6 to 13 inches	40

CASING.

	S. and S. Percent.
2 to 3 inches	58
3¼ to 4 inches	60
4¼ to 12½ inches	63

SHEETS.—Some of the independent mills have met the recent reduction of the American Sheet Steel Co., but those not having their own source of steel supply are no doubt doing so at a loss. Black sheets, one pass through cold rolls, in 500 bundle lots are quoted as follows: No. 28, 2.75c; No. 27, 2.65c; No. 26, 2.55c; Nos. 22 and 24, 2.45c; Nos. 18 and 20, 2.35c; Nos. 14 and 16, 2.25c; Nos. 10 and 12, 2.10c to 2.15c. The competition on galvanized sheets continues very keen and the new prices of the American Sheet Steel Co. is being met by the independent manufacturers. The new prices on galvanized sheets announced by the American Sheet Steel Co. for 500 bundle lots and over are as follows with their equivalent discounts: No. 16, $2.60, or 75 and 10 and 3½ off; No. 18, $2.85, or 75 and 10 and 1 off; No. 20, $2.85, or 75 and 10 and 2 off; Nos. 22 to 24, $3.10, or 75 and 10 and 2 off; No. 26, $3.35 or 75 and 10 and 1 off; No. 27, $3.60, or 75 and 10 off; No. 28, $3.85, or 75 and 10 off; No. 29, $4.35, or 75 and 7½ and 2 off; No. 30, $4.50 or 75 and 10 and 5 off.

WIRE AND WIRE NAILS.—Owing to the concessions made by the various producers of wire nails and wire products during the past two months the American Steel & Wire Co. last week announced the following new list which is a reduction of $2 a ton on nails and wire and $7 on barb wire. We make the following quotations: Wire nails, carload lots, f. o. b. cars, Pittsburg, $1.90; less than carload lots, $2; plain wire, carload lots, $1.80; less than carload lots, $1.90; barb wire, carload lots, $2.20; less than carload lots, $2.30; staples, carload lots, $2.05, and less than carload lots, $2.15. Galvanizing, 30 cents extra. Cut nails are quoted as follows: Carload lots, $2.05, and less than carload lots $2.10, f. o. b. Pittsburg, plus freight to point of destination; terms 60 days, less 2 per cent off in 10 days.

MERCHANT STEEL.—A meeting of the shafting manufacturers is being held today at Lake George, New York, but it is not probable that any change in prevailing quotations will be made. We make the following quotations: Turned, cold rolled and ground shafting is held at 47 off in carload lots and 42 percent off in less than carload lots; tire steel, 2.15c to 2.25c; spring steel, 2.25c to 2.35c; toe calk, 2.30c to 2.40c. The following differentials maintain: Less than 2,000 pounds of a size and not less than 1,000 pounds, 10 cents advance; less than 1,000 pounds of a size, 30 cents advance. Tool steel is quoted 7 cents and upwards, according to the grade.

OLD MATERIAL.—The market continues very quiet, consumers buying only in small lots. Our quotations, gross tons, are as follows: Heavy melting stock, $21.50 to $21.75; low phosphorus melting stock, $23.50 to $24; steel rails, $21.50 to $22; re-rolling rails, $23 to $23.50; No. 1 cast scrap, $19 to $19.50; borings and turnings, $10.50 to $11; busheling scrap, $17 to $17.50.

COKE.—For the week ending Saturday, Sept. 27, the production of the Connellsville region amounted to 256,509 tons, a slight gain over the production of the previous week. Exceedingly high prices continue to be paid for coke for prompt delivery both for furnace and foundry use. We note the sale of 20 carloads of foundry coke for prompt shipment at $10 per ton at the ovens. For next year it is believed that the leading coke producer will ask $3 per ton for furnace coke and $3.50 for foundry coke. Outside producers, however, have practically decided to ask fully $1 per ton more for both grades of coke.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
519 MONADNOCK BLOCK, Oct. 7.

The increasingly vigorous fight that is being made in this market by independent manufacturers of finished material has resulted in an irregular state of affairs, so far as prices are concerned. Sheets, wire products, bar iron and merchant pipe have suffered most from the competition, and a readjustment in the prices of the first two mentioned materials has already been made. Strenuous efforts are being put forth by local manufacturers of bar iron to maintain the 1.95c schedule, but the close competition of smaller mills makes this extremely difficult and concessions are offered by all the mills to secure desirable orders. The past week has seen a decided improvement in the buying and specifications for finished products. The local bar mill that was shut down for several days for lack of specifications is running again; jobbers of sheets are having an active demand, though there are strong evidences of excess capacity, and manufacturers of wire products report that with fall orders coming in the condition of their plants is greatly improved. Sales were made during the week of 10,000 tons of rails, several thousand tons of plates and about 12,000 tons of structural steel. An order for 10,000 tons of bar iron was also placed by a car manufacturer with a local mill. No new sales of foreign steel are reported. There is little change to be noted in the pig iron market. The coke situation is still the dominating factor and no improvement is observed in it. Scrap iron is weak and prices are lower than they were several days ago.

PIG IRON.—Reports of a strike among the coal miners of Alabama, growing out of the trouble in the anthracite regions of Pennsylvania, and the probability of a number of furnaces in that State having to go out of blast as a consequence, have added another distressing phase to the local situation. The strike, it is stated, has been called by the local miners' unions, and should it not be settled within a few days, the shipments of contract iron from that State will be materially curtailed. The scarcity of coke has already made itself felt in the shipments of iron from other sections, and only a small number of furnaces are living up to their contract requirements. The Mayville furnace is in blast again, but as an offset to this Hamilton furnace at Hanging Rock, O., has been compelled to bank; and in all likelihood both the Iroquois furnaces will be banked in a few days. Buying of pig iron has not been active in the past week, sales being confined almost entirely to Southern furnaces. A local car wheel interest placed orders for 6,000 tons of Virginia basic iron, to be delivered in lots of 1,000 tons monthly in the first half of next year. It is intimated the price was in the neighborhood of $25 Chicago. There was the usual run of smaller orders in addition to the above sale for delivery next year, ranging from carload lots to 500 tons. Tentative inquiries are being received at some of the local sales offices for prices and deliveries of iron in the last half of 1903, one coming during the week from a consumer melting in the neighborhood of 20,000 tons a year. There has not been much demand for foreign iron, though a heavy inquiry for domestic spot iron is reported. Sales of the latter average several car loads a day, and are made at $27.65 for No. 1 foundry and $27.15 for No. 2 foundry. Foreign iron has a range from $26 to $28, according to grade and analysis. Some small lots of 5 percent silicon iron have been sold at $30.50 delivered. Several small orders for Lake Superior charcoal have also been taken. There is a wide spread in the prices of Southern iron for delivery in the first six months of next year, being from $20 to $24 at the furnace. We quote as follows:

Lake Superior Charcoal	$26 00 to 28 00
Local Coke Foundry No. 1	23 50 to 24 00
Local Coke Foundry No. 2	23 00 to 23 50
Local Coke Foundry No. 3	22 50 to 23 00
Local Scotch Foundry No. 1	24 00 to 24 50
Local Scotch Foundry No. 2	23 50 to 24 00
Southern Coke No. 1	24 15 to 24 65
Southern Coke No. 2	23 65 to 24 15
Southern Coke No. 3	23 15 to 23 65
Southern Coke No. 4	22 65 to 23 15
Southern No. 1, soft	24 15 to 24 65
Southern No. 2, soft	23 65 to 24 15
Southern Gray Forge	21 65 to 22 15
Southern Silveries	24 65 to 25 15
Jackson Co. Silveries	28 00 to 29 00
Ohio Strong Softeners	25 60 to 26 10
Alabama Car Wheel	27 15 to 27 65
Malleable Bessemer	25 00 to 26 00

BAR IRON.—Manufacturers report that specifications are coming in more liberally than during last month, though there is not much change to be noted in the tonnage of new business. An order was placed during the week by a car manufacturer for 10,000 tons of bar iron, for deliveries extending through next year. An inquiry has been received from another car builder for 1,000 tons of bar iron. The local mill that was closed for several days for want of specifications has resumed work again. There is fair inquiry for steel bars, deliveries being made promptly. We quote Chicago delivery, mill shipments, Bessemer steel, 1.75c to 1.85c; angles, less than 3x3, 1.85c to 1.95c, base; iron, 1.95c; hoops, 2.15c. Prices out of store, steel, 2c to 2.10c; iron, 2.20c to 2.25c; hoops, 2.40c to 2.50c; angles, 2.50c to 2.60c.

SHEETS.—Mills report that new business has fallen off as a result of the reduction made by the largest producer. In contrast with this, jobbers report that they have suffered no diminution in orders and are making no changes in their prices. We quote No. 27 black, mill shipments, Chicago delivery, 2.90c to 3.10c; galvanized, 3.95c to 4.10c; out of store, No. 27 black, 3.10c to 3.25c; galvanized, 70, 10 and 5 percent and 75 percent.

STRUCTURAL MATERIAL.—Local sales have amounted during the week to about 12,000 tons. Several new buildings are talked of in this city, but it will be some time before bids will be asked. Jobbers and structural yards report an active demand for all sizes and shapes. We quote mill prices, as follows: Beams, 15 inches and under, 1.75c; 18 inches and over, 1.85c; structural angles, 3x3 to 6x6, 1.85c; angles, channels and tees, smaller than 3 inches, 1.85c base; plates, 1.75c. Prices on lots from store vary from 2¼ cents to 3 cents a pound, according to the size of order and delivery required.

BILLETS.—A few small lots of domestic forging billets have been sold during the week, the price ranging from $38 to $40. Foreign billets are quoted $30 to $31.

RAILS AND TRACK SUPPLIES.—The local interest reports sales of 10,000 tons of standard sections. There is a good demand for light rails and track supplies, though mills are sold up on the latter for the balance of the year. Jobbers, however, are able to furnish fairly prompt delivery on spikes and track bolts. We quote standard sections, $28; second quality, $27; light rails, 45 pounds, $34 to $35; 12 pounds, $40 to $41; with regular differentials for intermediate sizes; light rails out of store, $45 to $50; track supplies, mill shipments, as follows: Angle bars for standard rails, 1.90c to 2c; spikes, first quality, 2.50c; second quality, 2.25c; track bolts, 3½x¾, with square nuts, 2.85c to 3.00c per 100 pounds; with hexagon nuts, 3.05c to 3.20c, with usual differentials for other sizes.

MERCHANT STEEL.—Manufacturers report that they are not soliciting orders under present conditions, and only accept such business as may be offered by old customers. One concern reports that its shipments into the west during the month of September were the largest for that month in its history. We quote mill shipments, Chicago delivery, as follows: Spring steel, 2.65c to 2.75c; sleigh shoe, 1.95c, flat sizes; concave and convex, 2c; out of store, 2.15c; cutter shoe, 2.50c to 2.60c; machinery steel, 2.15c to 2.25c, base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.25c to 2.35c; out of stock, 3c to 3.10c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 percent to 10 percent higher; cold rolled shafting, carload lots, 47 percent off, Chicago; less than carload lots, 42 percent off, Chicago.

MERCHANT PIPE.—There is a good demand for all sizes, prices being shaded owing to the active competition of independent mills. Shipments of boiler tubes are badly belated and jobbers report that several sizes in their stocks are depleted. We quote as follows:

MERCHANT PIPE, RANDOM LENGTHS.

(Jobbers, Chicago Basing Discounts.)

	Black Percent.	Galv. Percent.
⅛ to ⅜ in. inclusive	58½	46½
¾ to 12 in. inclusive	65½	53½
(Consumers, Chicago Basing Discounts.)		
⅛ to ⅜ in. inclusive	56½	43½
¾ to 12 in. inclusive	63½	50½

BOILER TUBES.

Steel.

	Percent.
1 to 1½ in.	35
1¼ to 2½ in.	45
2¾ to 6 in.	55
6 to 13 in.	47½

Iron.

	Percent.
1 to 1½ in.	35
1¼ to 2½ in.	32½
2¾ to 5 in.	42½

CAST IRON PIPE.—Manufacturers report the usual run of small orders, this being a dull season for this class of trade. We quote 4-inch water pipe, $37; 6-inch and larger, $36; gas pipe, $1 a ton higher.

PLATES.—The demand is active for all sizes, and one manufacturer reports that its capacity is taken for the entire twelve months of 1903. The local interest reports the sale of several thousand tons during the past week, 1,000 tons of which were placed by a shipbuilding concern. Chicago mills are now receiving orders for delivery in the first quarter of next year. We quote mill prices, Chicago delivery, future shipments: Tank steel, ¼ inch and heavier, 1.75c to 2c; flange steel, 1.85c to 2.10c; from stock, tank steel, ¼ inch and heavier, 2.25c to 2.40c; 3-16, 2.35c to 2.50c; No. 8, 2.40c to 2.60c; flange steel, 2.50c to 2.65c. We would note that though there has been no change from the mill price of 1.75c, independent mills able to give prompt delivery are asking not less than 2c to 2.10c for delivery within the next three to six months.

WIRE AND WIRE NAILS.—The leading producer reports a much better tone to the market and a healthier demand. It has readjusted its prices as follows: To jobbers, Chicago delivery, carload lots, smooth wire, annealed, 1.90c; galvanized, 2.20c; painted barb wire, 2.30c; galvanized barb wire, 2.60c; nails, $2.00; polished staples, 2.15c; galvanized staples, 2.45c. Prices to retailers are 5 cents higher than above quotations on carload orders, and 15 cents higher on less than carload lots.

COKE.—The coke situation in Chicago, and at points west of here, has been relieved to some extent by shipments of Colorado coke. This coke is intended principally for furnaces and cannot be used for all purposes. Nevertheless it has furnished some temporary relief. It can be put down for $10.50 to $11.50 in Chicago. No large supplies are to be expected from that source, however, and under normal conditions Colorado coke could not be handled, owing to the excessive freight rate. Several hundred cars have probably been received during the week. Connellsville coke for spot delivery commands from $12 to $13. There is no improvement in the shipments from this region.

OLD MATERIAL.—There has been little buying in the past week, and the values of all kinds of scrap have suffered a reduction. We quote as follows:

Old Iron Rails	$24 50 to 25 00
Old Steel Rails (mixed lengths)	19 00 to 19 50
Old Steel Rails (long lengths)	23 00 to 23 50
Relaying rails	31 00 to 31 50
Old wheels	20 50 to 21 00
Heavy melting steel	17 50 to 18 00
Mixed country steel	15 50 to 16 50

The following are selling prices per net ton:

No. 1 R. R. wrought	$20 50 to 21 00
No. 2 R. R. wrought	19 00 to 19 50
Shafting	20 00 to 21 00
Dealers' forge	16 50 to 17 00
No. 1 busheling	15 00 to 15 50
No. 1 Machine Cast	17 00 to 17 50
Railroad Cast	16 50 to 17 00
Railway malleable	16 00 to 16 50
Country malleable	15 00 to 15 50
Iron axles	24 00 to 24 50
Steel axles	20 00 to 21 00
Cast borings	10 50 to 11 00
Wrought turnings	14 00 to 14 50
Iron axle turnings	15 00 to 15 50
Steel axle turnings	14 50 to 15 00
Stove plates	11 50 to 12 00
Old iron splice bars	21 00 to 21 50

David Evans, 1525 Monadnock block, has secured the sales agency for the Chicago territory of the product of the LaFollette furnace, owned by the LaFollette Coal, Iron & Railway Co., LaFollette, Tenn. The company is making prompt shipments of iron of all grades, and quotes No. 2 foundry, $28.15; No. 3 foundry, $27.65, and silvery gray, $29.50, Chicago delivery.

F. M. Minninger, for a number of year Chicago sales agent for the National Tube Co., has been appointed sales agent at Chicago for the Youngstown Iron, Sheet & Tube Co., Youngstown, O., with offices at 1136 Stock Exchange building. This company is making a specialty of double refined puddled iron pipe.

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Oct. 8.

The recent reduction in the prices of sheets, wire and wire nails has caused some discussion as to the effect of those changes on the general situation. A few who are not inclined to be optimistic predict that the market in other lines will not be so strong, but this is not the general opinion, as conditions which have affected sheets and wire are entirely absent as to most other products. Certain it is that no depressing effect is now noticeable in the general market. There has also been some discussion as to the effect of the reduction in prices of sheets on the smaller producers. Much depends upon what provision such producers have made concerning fuel and sheet bars, but it is believed that some, at least, will be able to turn out sheets at present prices at a profit. It is not thought that the larger producers intend to inaugurate a crushing policy, but that the recent reduction has merely placed the sheet business on a fair competitive basis.

IRON ORE.—Shipments of ore from the Lake Superior district for September were 3,657,000 tons, making the total shipments for the season 20,708,610 tons, which is 558,945 tons more than for the entire season of 1901 and a gain of 5,551,505 tons or 36 percent for the period up to Oct. 1 as compared with last year. The shipments for September, 1901, were 2,893,669 tons. In August, 1902, the shipments were 4,078,311 tons. Dispatch during the week has been very poor, some vessels being held five or six days. The railroads are far short of being able to meet demands for locomotives and cars.

PIG IRON.—Sales of foundry pig iron are almost at a standstill. Furnaces are so far behind in deliveries and there is so little prospect of conditions being more favorable for the regular operation of furnaces that the owners are very slow to make promises of iron for the first half of next year. It is predicted, however, that before the end of the present month there will be considerable buying for the second half of next year. There has been unexpected delay in the delivery of Scotch and Nova Scotian iron purchased for the Cleveland market and the troubles of the foundrymen have not lessened. The coke situation has not improved. The furnace at Struthers, after being in blast three days last week, was again compelled to bank. Prices are unchanged and we quote as follows for shipment in the first half of 1903:

Bessemer	$22 25 to 22 75
No. 1 Strong Foundry	23 00 to 23 50
No. 2 Strong Foundry	22 50 to 23 00
No. 3 Foundry	21 75 to 22 25
Scotch No. 1	23 00 to 23 50
Scotch No. 2	22 50 to 23 00
Gray forge, Valley	20 50 to 20 75
Lake Superior Charcoal	25 00 to 26 00

FINISHED MATERIAL.—The placing of orders for four more steel vessels has caused increased demand for plates and shapes, but the only sale reported in this city is for 700 tons of shapes, to be rolled in Pittsburg. It is understood that a considerable part of the plates will be rolled in Chicago, an order for 2,000 tons having been placed in that city this week for delivery in March and April. While the pool price for tank steel is 1.70c, Cleveland, from 2c to 2.15c and even higher is paid for prompt delivery. The market for bars is quiet and there is no difficulty in giving early delivery on small sizes. Sales out of store, Cleveland, are at the rate of 2c for iron and 1.90c to 2c for steel, while from 2.10c to 2.25c is paid for large rounds. We quote steel bars at 1.60c for Bessemer and 1.70c for open-hearth, Pittsburg; bar iron at 1.80c, Pittsburg. The recent cut in prices for sheets on No. 18 and lighter gauges, except blue annealed, has not resulted in a large increase of business. As this is a dull season of the year for the sheet business, no very large addition to sales was expected. We quote 2.10c to 2.15c, Cleveland, for 3-16 inch sheets and heavier. Cleveland prices on mill sales of black sheets we revise as follows: No. 24, 2.65c to 2.75c; No. 26, 2.75c to 2.85c; No. 27, 2.85c to 2.95c; and the following prices out of stock: No. 10, 2.35c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.50c to 2.60c; No. 16, 2.95c to 2.70c; Nos. 18-20, 2.75c to 2.90c; Nos. 22-24, 2.85c to 3c; Nos. 25-26, 2.95c to 3.10c; No. 27, 3.05c to 3.20c; No. 28, 3.15c to 3.30c. On galvanized sheets we quote mill sales in carload lots, Cleveland, as follows: Nos. 10 and 11, 2.60c to 2.75c; Nos. 12-14, 2.70c to 2.85c; Nos. 15-17, 2.80c to 2.95c; Nos. 18-21, 3c to 3.15c; Nos. 22-24, 3.20c to 3.35c; Nos. 25-26, 3.45c to 3.60c; No. 27, 3.70c to 3.85c; No. 28, 3.95c to 4.10c; No. 29, 4.35c to 4.50c; No. 30, 4.85c to 5c. Galvanized sheets out of stock are quoted 75 and 2½ off.

OLD MATERIAL.—The strong demand for wrought scrap, axle turnings, wrought turnings and wrought drillings continues. Cast scrap is very scarce. There is a good demand for malleable railroad iron and it has advanced in price from 50 cents to $1. We quote Cleveland prices, all gross tons, as follows:

Old iron rails	$25 50 to 26 50
Old steel rails (over 6 ft.)	22 00 to 23 00
Old steel rails (6 ft. and under)	21 00 to 22 00
Old car wheels	20 00 to 21 00
No. 1 R. R. wrought scrap	23 50 to 24 00
Mill scrap	19 50 to 20 50
No. 1 machine cast scrap	20 00 to 21 00
Iron axles	29 00 to 30 00
Steel axles	28 00 to 29 00
Axle turnings	18 50 to 19 50
Wrought turnings (free from cast)	17 00 to 18 00
Cast borings	11 00 to 11 50
Uncut wrought iron boilers	12 00 to 13 00
Steel boiler plates	17 00 to 18 00
Grate bars	12 00 to 13 00
Pipes and flues (clean)	17 50 to 18 50
Tank iron	17 00 to 18 00
Hoop and band iron	13 50 to 14 50
Sheet iron	11 50 to 12 00
Wrought drillings	16 00 to 17 00
Malleable iron (railroad)	20 50 to 21 50
Malleable iron (agricultural)	17 50 to 18 00
Stove plate	13 00 to 14 00
Heavy steel	19 00 to 20 00

The Republic Iron & Steel Co. will move its Cleveland office Oct. 25 to the Citizens' Bank building, 190 Euclid Ave.

CINCINNATI.

Oct. 7.

The general conditions in the pig iron business, instead of improving from week to week, seem to become more exasperating. The coke shortage, which has been the leading cause for complaint, is now more acute than at any time. Lack of labor in some districts, lack of water in others and lack of transportation in all districts render the situation distressing. This week Virginia coke companies have withdrawn from the market entirely for any delivery. A sale of 10,000 tons of Virginia coke, contracted for the first half of next year delivery, put an end to business in this direction. For spot delivery prices have reached fancy figures. To add to the embarrassments of the situation comes the strike of the coal miners in Alabama, where the coal miners of the Tennessee Coal, Iron & Railroad Co. have gone out.

A slight relief from the general shortage in domestic iron for immediate delivery was the opening of the La Follette Coal, Iron & Railroad Co. furnace at La Follette, Tenn., which went in blast Sept. 24, said to be the largest and most modern furnace in the South. The stack is 20x90 feet, and the daily capacity 350 tons of foundry iron. This iron will be distributed through the Field-Croxton Iron Co., which is the sales agent for the La Follette Coal, Iron & Railway Co. Orders are now in for all the iron made and for the present it will be the policy to sell the output of this furnace from day to day, as the furnace makes it. They will take no orders for future delivery, believing in higher prices.

PIG IRON.—The volume of business for future delivery has not been large the past week. Inquiries for prices for the latter half of next year are more numerous, but if any business is being done beyond July, 1903, the transactions are being kept quiet. Prices have strengthened for No. 2 foundry. Very little spot domestic iron is being offered. For spot delivery we quote No. 2 foundry $25 to $26; gray forge, $20.25; No. 1 silvery, $27.25 f. o. b. Cincinnati. Small sales at these prices. Business in foreign irons is increasing. A good tonnage of English and German iron has been sold in this territory during the week. Prices f. o. b. Cincinnati for delivery after January 1, are as follows:

Southern Foundry No. 1	$23 75 to 24 25
Southern Foundry No. 2	23 25 to 23 75
Southern Foundry No. 3	22 25 to 22 75
Southern Foundry No. 4	20 75 to 21 50
Southern Foundry No. 1, soft	23 75 to 24 25
Southern Foundry No. 2, soft	23 25 to 23 75
Gray Forge	20 00 to 21 00
Northern Foundry No. 1	26 10 to 26 60
Northern Foundry No. 2	25 10 to 26 10
Southern car wheel iron	28 00 to 29 00
Malleable coke iron	25 00 to 25 75

FINISHED MATERIAL.—The market is well sold on large contract work and there is a good demand for small consumers. The inquiry for plates and structural iron is still heavy, with early deliveries for plates not obtainable. The sheet market is unsettled and quotations irregular. In black sheets sales of No. 10 are at 2.50c and of No. 12 at 2.60c out of store. Mill prices on No. 10 are 2.17c; No. 12, 2.27c for blue annealed steel. On sheets lighter than No. 18, one pass through cold rolls, there has been a reduction of $5 a ton. Tank plates out of store are quoted at 2.30c for ¼ inch, and 2.40c for 3-16 inch. Prices for bar iron in car load lots are: 1.92c base, half extras f. o. b. Cincinnati; steel bars, 1.72c base, half extras f. o. b. Cincinnati. Both are retailed at 2.20c base, full extras, out of store. Beams are selling at 3c retail and angles and channels at 2.40c for base sizes..

Wrought pipe and boiler tubes are quoted as follows for car load lots f. o. b. Cincinnati:

WROUGHT PIPE.

(Basing Discounts.)

	Black Percent.	Galv. Percent.
⅛ to ⅜ in. inclusive	58.8 & 7½	46.8 & 7½
¼ to 12 in. inclusive	65.8 & 7½	53.8 & 7½

BOILER TUBES.

	Steel Percent.	Iron Percent.
1 to 1½ in.	43.8 & 2½	41.3 & 2½
1¾ to 2½ in.	56.3 & 2½	38.8 & 2½
2¾ to 5 in.	61.3 & 2½	48.8 & 2½
6 to 13 in.	56.3 & 2½	38.8 & 2½

OLD MATERIAL.—The market is unchanged, with a good demand. Old iron car wheels are firm at last week's advance and scarce and wanted. Prices are not quotably changed, and are as follows:

Old No. 1 Wrought Railroad, net tons	$21 00
Cast Machine and Foundry, net tons	$17 00 to 17 25
Old Iron Rails, gross tons	25 00 to 26 00
Old Steel Rails, gross tons	24 50 to 25 00
Old Short Lengths, gross tons	18 00 to 18 50
Old Iron Axles, net tons	28 00 to 28 50
Old Iron Car Wheels, gross tons	21 25 to 21 50
Stove Plate, net tons	11 75 to 12 00
Wrought Turnings, net tons	16 00
Cast Borings, net tons	11 00

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST., Oct. 7.

PIG IRON.—The pig iron market in this vicinity during the past week was almost entirely dominated by the fuel situation. Foundries were heard from either on the score of being forced to curtail their operations or to suspend them entirely, because of their inability to procure coke, and buyers appeared to be unwilling to contract for iron for future delivery until they were sure they could get the fuel with which to melt it. This latter condition has not affected the situation in domestic iron, in view of its scarcity, but it has made itself felt in the trading in foreign irons. Sales agents here for the latter report a smaller business during the past week than for many weeks, although they say inquiries still continue to be numer-

ous. Cable advices tell of a stiffening in prices of foreign irons, but contracts consummated here have borne no evidence of the fact, at least up to this writing, prices ruling about the same as noted in this column last week. From information given here, there is more than a chance that if the strike in the anthracite region should continue for several weeks, ocean freights will be advanced, in consequence of the numerous steamers that are likely to be pressed into service to transport coal from the British Isles to this country, orders for which have already been placed in large quantities. Should this advance occur, foreign irons, in the opinion of sales agents here, will advance in proportion to the increased cost of freightage. The demand for foreign irons is less urgent now than it was several weeks ago; buyers have either made provision for future requirements, or have made up their minds to await developments.

The strike of the miners in Alabama has added a new complication to the iron market. Representatives here of the interests affected do not think it will lead to anything serious. They say the cause assigned by the miners for quitting work is too trivial to make the strike serious, and that the miners themselves will wake up to a realization of the fact before long. Advices from Birmingham are that there is little or no business doing in iron for delivery next year. One of the best known and most reliable men in this market is authority for the statement that one Southern interest is making sales of No. 2 foundry on the basis of $23 at Birmingham. This is the highest price we have heard. Southern producers as a whole, however, are still out of the market for next year's delivery. Northern furnaces are doing little or no business in this market for the same period. Sales of domestic spot iron in small quantities are heard of from time to time, and a wide range of prices is paid, a difference of from $1 to $3 appearing in the same grade of iron. New York prices, most nominal, are as follows: Northern, No. 1 X, $23.50 to $25; No. 2 X, $22.75 to $23.50; No. 2 plain, $22.25 to $22.50; Southern foundry No. 1, $22 to $23; No. 2 foundry, $21.75 to $22.50; No. 3 foundry, $21.25 to $22.75; No. 4 foundry, $20.25 to $21.25.

Finished Iron and Steel.—Interest chiefly centers in sheets, which are undoubtedly the most vulnerable feature of the finished material market. The reductions made by the leading interest have played havoc with prices, and to give accurately the quotations of independent mills or of jobbers is very difficult. The large jobbers do not take a pessimistic view of the situation, claiming that the demand is so small that the cut while sensational on its face is not of such great importance in reality. In structural material there has been no abatement of the activity recently noted, contracts for forward delivery being regularly made for considerable tonnage particularly for bridge purposes. Sheared plates continue in good demand, and higher premiums are now being paid for spot delivery than for some time past. The demand for bars is good, and there are frequent sales of small lots. New York prices are as follows: Beams and channels, 15 inches and under, 1.75c to 1.90c; angles, 3 to 6 inches, 1.75c to 1.90c; zees, 1.75c to 1.95c; bulb angles, 2.05c to 2.35c; deck beams, 2.05c to 2.25c; sheared steel plates, tank, 2.10c to 2.15c; flange, 2.25c to 2.30c; fire box, 2.30c to 3.50c; refined iron bars, 1.95c to 2c; soft steel bars, 1.95c to 2.10c; steel sheets, in carloads, New York; No. 28, black, 2.65c to 2.85c; galvanized, 75 and 5 off.

PHILADELPHIA.

Oct. 7.

Pig Iron.—The demand has not been very active and is confined to a large extent to small orders for emergencies, which have been met by imported iron. Consumption has been somewhat reduced on account of scarcity of fuel and the prospect is that more furnaces and manufacturing plants will be compelled to cease operation. Owing to this decreased demand and to the heavy importations, the market is easier. Cargo lots of Middlesboro are sold at $19.50 for No. 3; small lots, $20 to $21. Scotch, alongside ship, $22.50 to $23.50. There is very little American on the market.

Billets.—The tendency of prices is higher and foreign steel is selling at $28. The market is unsettled on account of the recent ruling of the treasury department, which requires $2.24 per ton additional duty on German steel. The ruling is based on the fact that German producers have a low price on export business which the United States authorities decline to accept as a fair valuation.

Finished Material.—While the market for sheets, wire, wire nails and tubes is weaker, the heavy lines are still strong. Plates are sold 2c and upward for prompt delivery and at 1.72c if buyers are willing to wait until July, 1903, for delivery. Structural material can also be bought at 1.72c, but for delivery any time in 1902 buyers must pay 2c to as high as 2.50c. Bars are selling at 2c and over for prompt shipments for steel from local mills and at 1.80c for western steel. Bar iron is selling at 1.92c to 1.97c for carload lots as minimum quantity.

The Metal Market.

NEW YORK.

Office of *The Iron Trade Review*,
Room 1909, No. 150 Nassau St., Oct. 7.

Pig Tin.—During the past week prices for pig tin have undergone many changes, with a receding tendency noticeable in the early part of the week, chiefly because the monthly statistics were not up to expectations, declines in spot and futures resulting both here and in London. Later, however, the market gained a little in strength, with prices firm, particularly on Thursday morning, in consequence of stronger cables from London. At this writing the market is fairly firm, with trading dull. Arrivals up to date from abroad amount to 435 tons. New York prices are as follows: Spot, 25.10c to 25.25c; October, 25c to 25.10c; November, 24.65c to 24.85c; December, 24.30c to 24.50c; and January, 24.25c to 24.50c. London, spot, £114 15s; futures, £113 15s.

Copper.—Dullness has been particularly noticeable in the market for the past week. Buyers seem to be holding aloof from the market on the belief that lower prices can be counted upon in the near future. On the other hand sellers manifest no eagerness to dispose of their holdings, and a featureless market results. Current trading has been due to consumers meeting current needs. In London a similar condition of affairs is noted. Exports to date aggregate 2,563 tons. New York prices, for large lots are as follows: Lake, 11.60c to 11.70c; electrolytic, 11.40c to 11.50c; casting, 11.37½c to 11.50c; and standard, 10.65c to 11c. London, spot, £52 2s 6d; futures, £52 5s 0d.

Pig Lead.—Prices are unchanged, with little trading. London market presented a similar aspect. In St. Louis the market has been dull, with prices ruling firm. Futures are strong. Sales have been made on the basis of 4.12½c for lots of 50 tons or more. Futures are quoted at 4.10c.

Spelter.—There is a great scarcity of supplies, and spot is strong at 5.50c. In St. Louis the market has been marked by a strong undertone, and prices have taken a wide range at times. The London market has shown some strength. Futures continue strong.

Antimony.—Weakness has been noted in all brands outside of Cookson's, which brings 9½c. Hallett's sells at 7¾c, while other brands command from 7¼ to 7¾c.

Nickel.—Trading is limited, and prices largely nominal, ranging from 40 to 60c, according to size and quantity.

Quicksilver.—The demand is fair, and prices are $48 per flask for 100-flask lots. London is quoted £8 15s.

CHICAGO.

Office of *The Iron Trade Review*,
519 Monadnock Block Oct. 7

Buying is of slighter proportions than for some weeks past, and quotations on copper, pig tin and spelter are weaker. The condition of the sheet and tin plate trade is largely responsible for the weakness in spelter. We quote jobbers' prices to consumers unchanged, as follows: Lake copper, carload lots, 12¼c; less than carload lots, 12½c to 12¾c. Pig tin, 27½c; Pig lead, carload lots, 4.10c; less than carload lots, 4½c. Sheet zinc, carload lots, 6½c, and 6.65c in lots of 600 pounds. Spelter, carload lots, 5.35c; less than carload lots, 5¾c to 6c. Antimony, 10¾ to 11c for Cookson's and 9¾ for Hallett's in small quantities. Nickel, 55c to 65c, according to size of order and delivery. Inquiry for old metals is good and prices are firm. Selling prices of dealers are as follows: Copper wire, $10.50; heavy copper, $10.50; light copper, $9.50; red-brass, $10.75; yellow brass, $8.25; light brass, $6.75; lead pipe, $3.90; zinc, $3.75.

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ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

OCTOBER 9, 1902

THE REVOLUTION IN ORE UNLOADING.

In a labor paper column devoted to the longshoremen's union of the Lakes is this paragraph: "Machines are displacing more men every day. It is thought, however, that there will be better pay and conditions for those left."

And the surmise is true. Well nigh dehumanizing was much of the labor of the men who worked like beasts of burden in the holds of vessels in the old days, that are not so far back. With the advent of the ore unloading machines at lake ports have come the better pay and better conditions the labor paper refers to, but there has come also vastly more. In ten years has come a quadrupling of the tonnage of iron ore unloaded. The rapid development of the iron industry, of which this is an index, has stimulated the inventions that have released an army of men from exhausting work in vessel holds and sent them into other employments. Instead of a week or 10 days, as under the methods of a dozen years ago, or two or three days, as in recent years, one of the most effective of modern unloading machines recently took out the greater part of a cargo of 5,462 tons of ore in three hours, while the entire time including the supplemental cleaning up with smaller buckets was but 4 hours and 54 minutes. Were it not that machinery has come to the rescue there would not be sufficient dock space available on Lake Erie to accommodate the number of vessels that would require to be unloaded simultaneously, to get down in a single season of navigation the 25,000,000 tons of ore that will be moved by water this year.

Ore boats now make in a season a number of round trips that ten years ago would have been deemed beyond the limits of possibility. In the matter of cost, instead of 8 or 10 cents a ton for unloading, as was common not many years back, it is now a question of how large or how small a fraction of a cent per ton is to be reckoned for this item. The tonnage cost of interest on a plant of unloading machinery is now so close to the tonnage cost of the unloading itself that the outlay for equipment is coming to weigh quite as much in deciding what plant to install, as the number of tons that can be taken out in an hour with a given type of machine.

The foreign field is one in which the unloading devices now so well known on the Great Lakes should show revolutionary economies. An incident in connection with the unloading of a cargo of ore at Sydney, Cape Breton, is in point. A fast plant of one of the types used on the lakes is employed there. A foreign vessel arrived with ore and the captain and mate, in expectation of the delay to which they were used, went off some miles inland for a fortnight's visit with friends. They had scarcely arrived at their destination before they were summoned back to start on the return trip. They were not a little indignant that their visit was so inconsiderately interrupted by the "Yankee" devices for rushing things. If sailing time is counted as money by the owners of vessels carrying Spanish ores to British ports, it is inconceivable that they should long delay to adopt the machinery of the Great Lakes at unloading points. The possible saving runs anywhere from $1 to $2 a ton.

MORE OF THE MALIGN WORK OF THE TRUSTS!

As illustrating how the exercise of business prudence on the part of a manufacturer can be perverted into a case of "trust tyranny," the comment of certain daily papers on the experience of some Western railroad promoters is in point. A line was laid out on paper and then an inquiry was sent to a number of rail makers. The rail mills refused to quote until they were informed definitely where the proposed road was to be located and given proof that the project would certainly be carried through. It is well known in the iron trade that one important particular in which present conditions are different from those that have often prevailed in the past is that in all business now being booked ahead the utmost care is exercised to see that the material contracted for will be actually taken when the time comes. The exercise of this business prudence has put the trade on a sounder basis in rails, plates and structural shapes than it has ever known. The information desired by the rail mills from the Western railroad promoters in question was simply for the purpose of establishing whether the project was certain to be carried through or not, and was in line with this sound policy, yet the partisan press has endeavored to establish in it a clear case of the rail mills seeking to stifle competition with some existing railroad line, in which they are alleged to be interested. Nothing could be more absurd. The rail mills are not interested in railroads and would encourage the building of new roads rather than otherwise. Over half these mills are outside of the United States Steel Corporation. What they do desire is that their books shall carry no rail orders which are not of a strictly bona fide character.

THE OVER-SUPPLY OF SHEET MILLS.

There are rather definite reports that several independent sheet and tin plate mills are quietly offered for sale. The overcrowded condition of the industry would have been apparent on careful investigation at any time in the past year, yet it seems that it was not until the cut recently made by the leading interest that the true state of affairs was forced on the attention of those who have promoted a number of local-aid projects. Several plans for sheet and tin mills which three or four months ago seemed certain to be carried out have been abandoned, and it would not be surprising if the reports that some existing mills are for sale should prove to be correct. It is the general belief that No. 28 gauge sheets cannot be made profitably from $30 billets. In the case of galvanizing, however, there seems to be some profit in the spread between black and galvanized market figures, and this points to a reduction in this spread. The same conditions are bound ultimately to prevail in galvanized sheets as have prevailed for four years in tin plates, that there shall be no profit in the coating operation. The spread between black plates and coke tin plates is two or three cents a box less than the actual factory cost of applying the

coating and finishing the plates. In all lines profits are tending irresistibly back to the cruder operations of manufacture. The day is fast approaching when the finishing department will be simply a means of disposing of the cruder material produced.

TIN PLATE WAGE MATTER UNCHANGED.

(Special Telegram.)

PITTSBURG, Oct. 8.—The members of the conference committee of the Amalgamated Association of Iron, Steel and Tin Workers returned from their meeting with the officials of the American Tin Plate Co. at New York this morning. The status of the rebate tin plate proposition remains unchanged, despite the seven-day conference for the discussion of the matter. The various phases of the proposed 25 percent reduction on rebate tin plate were taken up and discussed at length. Considerable time was spent in the attempt to formulate some plan whereby the tin plate workers could be guaranteed that all the tin plate made at a wage reduction of 25 percent would find its way into the export trade as the tin workers have expressed fears that some of the tin plate thus made might be used for domestic use, despite the assurances of the American Tin Plate Co. that such could not possibly be the case. This is one of the numerous arguments, which though groundless caused the tin workers again to turn down the rebate proposition.

There is no immediate prospect of a resumption of operations at the mills of the American Tin Plate Co., as the members of the conference committee were shown figures detailing the present condition of the tin plate trade. The men will without doubt be called upon again by the Amalgamated Association officers to vote on this proposition, or if this plan is not pursued a special convention of the tin plate workers will be called for the purpose of finally passing upon the question. Statements have been repeatedly made that the independent tin plate mills would not profit by such a reduction made by the tin workers. Such is not the case. The 25 percent reduction on rebate plate, if accepted, would be inserted in the tin plate scale and if any of the independent manufacturers desired to take any of the rebate plate trade they would be at liberty to do so and take advantage of the 25 percent reduction in wages.

Sheet Mills to Start Up.

(Special Telegram.)

PITTSBURG, Oct. 8.—The American Sheet Steel Co. has ordered a resumption of operations at its New Philadelphia, O., plant on Monday, Oct. 13. Other idle mills will be placed in operation in the near future, the reduction on sheets recently announced having resulted in a very heavy demand for the sheets thus affected.

Good progress is being made upon the construction of the National Carbon Co.'s new grinding building in Cleveland, to replace the structure which collapsed about the middle of August. The T. H. Brooks Co. has completed the erection of the very heavy steel frame in less than seven weeks. Hunken Bros. have the contract for brick and carpenter work and the National Fireproofing Co. for concrete floors and roof. It is expected that the building will be entirely completed and machinery installed by Nov. 1. Plans and specifications of buildings and equipment were prepared by the Osborn Engineering Co., of Cleveland.

The Blast Furnace Syndicate, Wm. Edenborn, chairman, 71 Broadway, New York, has been formed, with subscription of $2,500,000, and purchased the capital stock of the United States Iron Co. (organized several years ago by John W. Gates, of the United States Steel Corporation and his associates), owner of the large tracts of ore lands and several undeveloped mines which have heretofore supplied ore to the Sheffield and Florence furnaces in Alabama. The syndicate has purchased Sheffield Coal, Iron & Steel Co., including its Russellville ore properties, and the three furnaces at Sheffield, Ala. One of these furnaces is in blast, and the other two will be promptly relined, repaired and blown in. Foundations for two additional blowing engines are being laid and additional stoves are under negotiation, the entire plant to be modernized.

STRIKE OF THE TENNESSEE COMPANY'S MINERS.

(Special Telegram.)

BIRMINGHAM, ALA., Oct. 8.—The only developments in the strike situation here this week are that 4,200 Tennessee Coal, Iron & Railroad Co. men have been called out and that about 400 negroes returned to work at Johns in the Blue Creek division. All other companies in Alabama are mining up to full capacity and it is not believed that the strike will spread beyond the Tennessee company. The Tennessee Coal, Iron & Railroad Co. has not begun to bank its furnaces on account of the strike, but from the present outlook all but three or four will stop soon. The company is putting out 1,700 tons a day with convict miners, which will keep at least three furnaces running and these will supply the steel plant at Ensley. The Alabama Steel & Wire Co.'s rod mill at Ensley has shut down on account of coal supply being cut off.

The cause of the strike was the refusal of the company to collect assessments levied by the union for the anthracite miners, except upon written orders from the men. Many of the men were willing to pay the $1 weekly assessment, but others were not and the union demanded that the company either collect from those unwilling to pay or discharge them. This the company declined to do. The newspapers of Birmingham denounce the strike in the strongest terms. They point out editorially that the ordering of the strike is a violation of the existing contract between the mine workers and the operators, and that it is not justified on any reasonable grounds whatever.

The Foundrymen's Association.

The regular monthly meeting of the Foundrymen's Association was held at the Manufacturers' Club, in Philadelphia, on Wednesday, Oct. 1, the president, Thomas I. Rankin, occupying the chair.

The treasurer, Josiah Thompson, reported a balance in the treasury of $3,070, and all bills paid.

The Manufacturing Co. of Carlisle, Carlisle, Pa., was elected to membership in the association.

According to the constitution of the association, nominations for officers for the ensuing year were in order, but it was deemed advisable to leave the matter in the hands of a committee, therefore on motion the president appointed S. L. Moore, Josiah Thompson, and George C. Davis as a nominating committee to report at the next meeting, and at this meeting the election also will be held.

The paper of the evening was by J. H. Pepper, editor of the *Brass-Founder and Finisher*, Philadelphia, on "A New Kiln and Furnace; and Its Possible Adaptation in the Annealing of Malleable Castings." The paper, which will apear in our next issue, was illustrated by lantern slides.

After adjournment the usual lunch was served.

New Coke Ovens in the South.

Among the companies in the south which are building, or planning to build, coke ovens are the following:

The Douglas Coal & Coke Co., Dunlap, Tenn.; has begun construction of fifty coke ovens. The Bon Air Coal & Iron Co. has voted $100,000 for the construction of additional coke ovens; J. M. Overton, manager; offices at Nashville. The Etna Coal & Coke Co. contemplates making extensive improvements to its coal mines and erecting an additional battery of coke ovens; offices at Chattanooga. The Blast Furnace Syndicate, New York, has purchased the Stone Gap Colliery Co., Wise Court House, Va. Its mines, 6,500 acres of coal lands, etc., and will develop same. It has begun construction of 300 coke ovens to supply fuel from these mines to its Sheffield furnaces. The Alabama Steel Wire Co., Ensley, Ala., has advertised for bids on construction of 200 to 300 coke ovens.

The directors of the United States Steel Corporation issued on Tuesday a statement of net earnings for the nine months of the past year ended Sept. 30. Earnings for July, August and September, with the last month estimated, aggregated $36,764,643; total net earnings for the nine months, deducting each months expenses for ordinary repairs, rentals and maintenance of plant, also interest on bonds and fixed charges of the subsidiary companies aggregate $101,142,158. The usual dividends of 1¾ percent on the preferred and 1 percent on the common quarterly were declared.

THE BRYANT METAL CUTTING MACHINES.

The Q. & C. Co., Chicago, has recently placed on the market a line of metal cutting machines that embody a number of improvements. There are two distinct types—"Bryant" saws, in which the saw blade is driven by a gear or sprocket wheel engaging with the teeth formed on the periphery of the blade, and arbor driven saws, on which the saw blade is driven by a central mandrel or arbor. Both types are made in two styles, cut-off saws and universal saws. In the cut-off type the blade travel is short, and the machine is especially designed for cutting off bars, round and square, structural shapes, etc. In the universal type, the travel of the blade is longer and the machine is fitted with an upper side table on which the work can be cut off for the entire length of the travel of the saw blade, while they are also arranged with V blocks and lower tables for cutting bars and shapes.

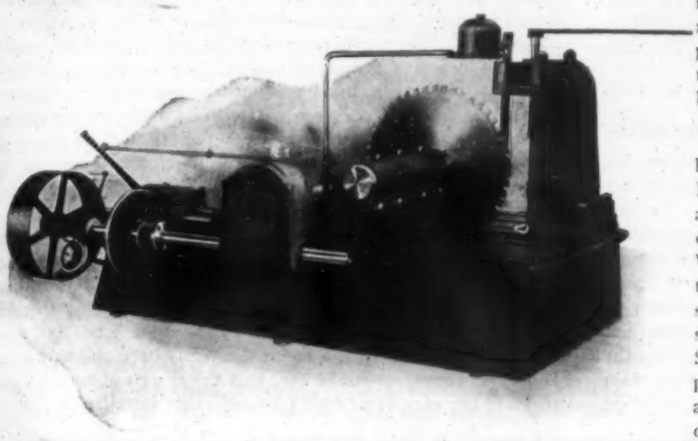


FIG. 1.—BRYANT CUT-OFF SAW, BELT DRIVEN.

The illustrations herewith show two views of a Bryant cut-off type of machine, one belt driven, and the other motor driven. Any machine, when desired, can be mounted on a circular base, which can be completely rotated by rack and pinion, this being a desirable feature where there is not sufficient room for swinging a long beam. Lateral adjustment of side tables can be furnished, if required, so that work can be adjusted for cutting after being secured.

Special attention has been given to the arrangement of the tables on all machines, so that work can be placed most advantageously for cutting with a minimum distance of blade travel. The lower side tables are of sufficient length to permit beams, etc., to be properly supported when being cut off at any angle up to 45 degrees, and to permit of steel castings within the ecapacity of the machine being secured to it. All machines are fitted with the Q. & C. Co.'s friction feed, giving an automatic feed variable with the machine in motion from ¼ inch to 1 inch per minute on the Bryant saw and from 3-16 to 13-16 inch per minute on the arbor driven saws. The feed is powerful in its action and gives a constant driving force throughout its entire range. The feed wheel is connected to the feed screw by a clutch operated by a lever, by moving which it is engaged or disengaged. In the universal saws the clutch also operates the power return movement with which these machines are fitted. A rod attached to this lever engaging with the carriage operates an automatic stop in both directions. When the clutch is disengaged the carriage can be moved in either direction by hand. The feed nut is solid, 6 inches in length and bushed with bronze. It is bolted and tongued to the carriage, and can be readily removed without dismantling the machine.

The Bryant saw carriage is in two parts, the sprocket shaft bearing being cast in one piece with the worm gear hood and movable 2½ inches towards the axis of the blade, allowing for a wear of 5 inches in its diameter. The sprocket is removable, and all sprockets on these saws are interchangeable and readily replaced.

The arbor-driven saw carriage is of good design and exceedingly strong and rigid. All bearings are divided at right angles to the direction of the wear and are of extra large proportions. Both arbor gear and pinion are solid with the shaft, the pinion being hardened. The width of the face is large, and the liberal proportions employed have produced a rigid and quiet-running machine. All gears in both types of machines are entirely enclosed, avoiding dust and the wear entailed when machines are not advantageously placed. The shears and tables are of strong and rigid design and are provided with oil troughs so that all lubricant is returned to the central trough underneath the saw blade.

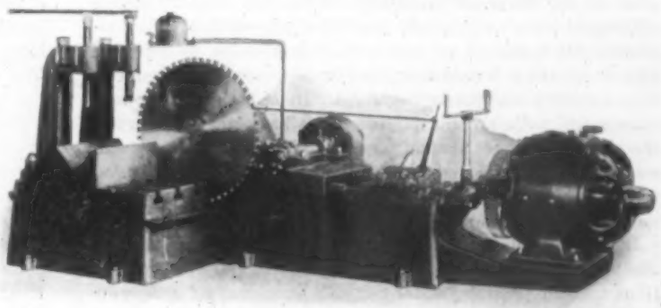


FIG. 2.—BRYANT CUT-OFF SAW, MOTOR-DRIVEN.

The Buffalo & Susquehanna Iron Co., of Buffalo, have contracted with Wm. B. Scaife & Sons Co., of Pittsburg, for a 6,000-h. p. We-Fu-Go water softening and purifying system. This is the third plant purchased by interests identified with this company. Wm. B. Scaife & Sons Co. are receiving large contracts for both the Scaife and We-Fu-Go water softening and purifying systems. There are now in successful operation over 200,000-h. p. in the United States, handling over 25,000,000 gallons of water daily, principally for boiler use, although a part of this amount is devoted to other uses where soft water is desirable. Among recent sales are the following: Pennsylvania Salt Mfg. Co., Wyandotte, Mich., 1,750-h. p.; Hecla Portland Cement & Coal Co., N. Bay City, Mich., 1,500-h. p.; Hecla Portland Cement & Coal Co., West Branch, Mich., 500-h. p.; the Toledo Furnace Co., Toledo, O., 3,750-h. p.; the National Mining Co., Sygan, Pa., 1,000-h. p.; Pittsburg Plate Glass Co., Elwood, Ind., 2,500-h. p.; Lancester Mills, Clinton, Mass., 1,000,000 gallons.

About 800 employes of the American Iron & Steel Co., at Lebanon, Pa., have returned to work after being on a strike for three weeks. The puddlers and rolling mill men, about 700, who went out May 5, have not returned to work.

The Eberhard Mfg. Co., Cleveland, manufacturer of wagon and carriage hardware, will build a new engine room, iron and brick, at a cost of $4,000.

The Mount Union Silica Brick Co., of Mt. Union, Pa., of which W. H. Hill, Park Building, Pittsburg, is the sales agent, has contracts for furnishing high grade silica bricks for fourteen open-hearth furnaces that are under construction at present. One order calls for all the brick required in the erection of five 50-ton open-hearth furnaces at the new plant of the Alan Wood Iron & Steel Co., Conshohocken, Pa., and another contract recently closed calls for all the brick for two 40-ton open-hearth furnaces for the United Steel Co., at Canton, O. Contracts for brick recently closed call for the delivery of 1,500,000 brick before the first of the year. The Savage Fire Brick Co., of which Mr. Hill is also the sales agent, has closed contracts for high grade fire brick and shapes during the past ten days calling for 3,000,000 brick.

LARGE CRANE RACK CAST IN ONE PIECE.

The steel crane rack illustrated herewith was recently cast at the plant of the Pittsburg Steel Foundry, Glassport, Pa. It is 33 feet in length and was cast in one piece. Heretofore these racks have been cast in two lengths, and casting in one piece presented many interesting problems in molding. Inasmuch as this was the first rack cast in one length there were grave doubts about the success of the operation, but when the sand was cleared away it was found that the casting was without flaw and that the work had been entirely successful. The rack is hollow almost its entire length.

COLLECTION AND REMOVAL OF REFUSE FROM GRINDING AND POLISHING MACHINES.

BY A. W. BAYARD, M. E.

The various abrasive processes of different industries—grinding, polishing and buffing—are productive of great quantities of matter in such a finely divided state that it is easily held in suspension in the air. In view of the extension of uses for emery, corundum, carborundum, and other abrasives and polishing agents, the problem of adequately collecting the dust or lint becomes one of no small importance. Three main reasons may be assigned why this product of the grinding wheel should be taken care of, and of these three in any individual case one or all may apply. In the first place, the dust laden atmosphere of a shop may be looked at from the viewpoint of the health of operatives. This consideration applies with equal force to shops pervaded by disagreeable or injurious ordors and fumes of all sorts and it is pleasing to note that greater attention is paid every day to this important consideration, formerly so grossly neglected. Indeed, the wide awake manager of large present day industries has come to recognize the great advantages accruing from making the workman's surroundings congenial and healthful, advantages which manifest themselves in a decreased percentage of absentees, as well as in the accomplishing of more and better work.

A LARGE STEEL CRANE RACK, CAST IN ONE PIECE.

In the next place, it often happens that grinding wheel dust must be caught and removed in the simplest and most expeditious manner possible, either to avoid its too rapid accummulation, or else to prevent any injurious effect which such refuse may have upon processes going on in portions of the factory contiguous to the grinding or polishing rooms. Again the case often arises where the material is of such value that economy demands the careful collection of the small particles removed by the wheel.

We come now to consider the most effective mode of accomplishing the desired end. The ideal system must be unfailing in action, free from complication and low in cost. On account of the minuteness of the particles to be handled and their consequent lightness, the proper application of air currents at once suggests itself as most feasible. If we place a hood in close proximity to the point at which the grinding is done, and reduce the pressure within the hood, atmospheric pressure serves to create currents into the hood of sufficient strength to carry the refuse particles along with them. The branch pipes from the hoods of the various wheels connect with a main duct, which in turn leads to the exhaust inlet of the rotary centrifugal fan, which is the device universally employed for this purpose.

Although at first glance it would seem a simple matter to design a proper duct conveying system, in reality there are a number of points which require careful and intelligent handling. In different processes, the grinding is done at different points of the wheel and this must be considered in the design of the hood. Provision must also be made for adjusting the hood to allow for any wear of the wheel. Where the motion of the wheel imparts a downward direction to the particles, the main exhaust pipe is placed below the machine with the hood branch pipe leading down to it. When the dust is projected upwardly, however, it often becomes imperative for a proper working of the system to locate the exhaust piping above, though with a greater expenditure of power due to lifting the refuse matter. Various considerations enter in any specific case to determine the proper arrangement of the hoods and piping, so that it is impossible to lay down any hard and fast rule. Indeed, it should be stated here that the design of such a system and the various problems arising in its installation should be referred to those whose previous experience in such matters place them in a position to provide a successful and economical system.

The fan usually to be employed is known as a volume exhauster, built of a cast iron casing within which revolves a blast wheel constructed of steel plate blades bolted to cast iron spider arms. The size of the fan depends of course upon the system to be served, that is, the size and number of grinding wheels. A grinding wheel 10 inches in diameter requires a branch pipe 2 inches in diameter; a wheel 12 to 18 inches in diameter requires a 4-inch pipe, and wheels 18 to 24 inches require a 4½-inch pipe. The area of the main pipe leading to the exhauster will be governed by the combined areas of the branch openings, and by its length. For short lengths, the main pipe may be made of a sectional area equal to or even a trifle less than the sum of the branch pipe areas, 80 percent being very good practice. This is because the friction for a given velocity is so much greater in small pipes than in large. To avoid excessive frictional losses it becomes necessary also to increase the main pipe diameter in proportion to the length of the pipes. In this connection, it may be of interest to mention the tables found in the catalogue of the Buffalo Forge Co., of Buffalo, dealing with these points, and various others also, such as the horsepower required to overcome the friction of air in passing through pipes, etc. The main exhaust pipe, it must be added, should be reduced in size as it recedes from the fan and as the various branches lead off from it. In every branch pipe, should be a blast gate, by shutting

which when its particular wheel is not in operation the section at the other wheels may be increased. The greatest care must be exercised to avoid any pockets or low places in the piping where the dust can collect, because the danger of clogging must be carefully guarded against. For this reason also the laps or joints in the pipe must always be laid in the direction of current flow, and for efficient working the main pipe should be as straight as possible, without curves or bends. The branches should connect with the main pipe by an easy curve, also in the direction of flow. A most frequent defect of such systems is clogging after longer or shorter use, and hence the foregoing points must receive careful attention.

Having determined the maximum diameter of the main exhaust pipe which at the proper pressure will handle the air without excessive frictional losses, we select a fan whose inlet orifice has an equal diameter, and speed the same up until the desired pressure is obtained. The pressure is proportional to the velocity. Owing to the lightness of lint from buffing wheels, 3 ounces pressure will usually suffice therefore. For emery wheels about 5 ounces is required, though if the grinding is heavy 6 or 7 ounces will be needed. Where the emery refuse is to be lifted to an exhaust pipe above the wheels, a speed must be imparted to the fan to give 6 to 9 ounces, according as the work is light or heavy. It may be mentioned here that for emery systems the piping should be extra heavy to withstand the wearing effect of the particles. In the case of light stringy refuse, the fan wheel should be of special construction to obviate clogging at that point.

When the grinding on one set of wheels is much lighter than on another, or when wheels for two different processes are used, it will usually be found preferable to have two independent systems rather than try to handle all the refuse with one fan. In the first place, the independent fans may be run at those speeds which are best suited for economy in each case. Again less piping will ordinarily be required than when a single system is employed. Buffing and emery systems should invariably be kept separate.

The refuse laden air discharged from the fan may be piped out of doors where its dissemination would do no harm, or it may be led to some form of dust collector. In one form the dust is separated by centrifugal force and drops to the bottom of the collector, while the air passes out at the top. A somewhat more successful form discharges the air downward just above the surface of a vat of water. The refuse collecting at the bottom of the vat may be shoveled out periodically or washed out with a stream of water.

I have endeavored in the foregoing remarks to bring out a few of the points connected with this question, treating it necessarily in a somewhat superficial manner. In concluding I wish to heartily commend all enactments, present of future, State or Federal, looking toward the betterment of the artisan's working conditions. Such exhaust systems as those I have just outlined come under this head; in addition to ridding breathing spaces of much unhealthful matter, in many cases they also provide the only ventilation, small though it may be, which such rooms receive.

The Philadelphia Steel & Iron Co. has been organized to take over the business, plant, good will, etc., of the Ferro-Carbon Casting Co., of Frankford, Philadelphia. The new corporation is capitalized at $1,000,000 of which $300,000 is 6 percent non-cumulative and non-voting preferred and $700,000 common. A bond issue of $300,000, 6 percent is authorized, of which $250,000 is to be issued and sold at par. The directors of the new company are J. Wesley Allison, president of the Cramp Steel Co.; Chas. M. Jesup, president of the Eastern Trust Co.; S. C. Smith, Phillipsburg, Pa.; A. C. Rex, Philadelphia; G. H. Meldrum, New York; W. J. Hilands, Chicago, and J. K. Caldwell, Philadelphia. The object of the new corporation is to extend the manufacture of Atlas steel castings.

Rapid progress has been made during the past month in building the new Allis-Chalmers shops at West Allis. Last week witnessed the completion of the floor plate in machine shop No. 1, said to be the largest floor plate in the world. It is 25 feet wide and 200 feet long and grooved at intervals of every foot.

THE SCIENCE OF THE WORKSHOP.*

BY WILLIAM TAYLOR.

Among the writings of engineers themselves, there is probably nothing which defines more perfectly the foundation of their craft than that which Emerson wrote in his essay on "Civilization," where he says: "All our strength and success in the work of our hands depend on our borrowing the aid of the elements. You have seen a carpenter on a ladder with a broad-axe, chopping upwards chips from a beam. How awkward! At what disadvantage he works! But see him on the ground, dressing his timber under him. Now, not his feeble muscles but the force of gravity, brings down the axe; that is to say, the planet itself splits his stick. . . . And that is the wisdom of a man in every instance of his labor, to hitch his wagon to a star, and see his chore done by the gods themselves."

Except that it applies equally to every other department of human work, this saying of Emerson's, "hitch your wagon to a star," might appropriately be written as the motto of this section of the British Association which exists for the advancement of the science of engineering. For the true science of engineering consists in the ordered study of these stars and their courses, the materials and forces of nature with which we have to deal, and which in all successful work we do but use in their own ways to be the servants of our will.

This conception of the function of science in engineering is now accepted with more or less distinctness, not only among men of science, but by men who distinguish themselves as practical engineers. But up to the present time the idea has been limited mainly to engineering design, the business of the drawing-office; while the older part of engineering, the business of the workshop, which flourished as a craft long before even the name of science was known, is not sufficiently regarded, either by men of science or by practical engineers, as being capable of scientific treatment.

Not long ago I was engaged in a correspondence on this subject, when the director of a technical school wrote to say, "If you will favor us with a call, I think I can show that we are doing in a thorough manner what you say is everywhere neglected." I called; and found that during each term the equivalent of three weeks was devoted by the students to exercises with the chipping chisel, file, scriber, center punch, drill, lathe, and planer. Another principal wrote, "You are much mistaken. Besides general physics and mechanics, which we treat in a thoroughly practical way, we have a well-equipped workshop, including an automatic screw machine; and have engaged an expert from America to show our students how to cam it for any job within its capacity."

I have quoted these cases because I believe they represent fairly, not perhaps the best, but the average position of technical schools regarding the subject of this paper. Not in engineering alone, but in other crafts, through the lack of suitable knowledge, our technical schools are reduced to the necessity of teaching workshop practice, merely by following the methods and copying the appliances of trade itself. In this way they ever lag behind the best business establishments; and thus it is that skilled artisans find in our evening schools comparatively little to help them in their own daily work. It would be an exaggeration, however, to say that we have no science of the workshop. A considerable part of the material is already to be found scattered in various books and papers, and much more is known to experienced men, and only awaits publication; but, so far as I am aware, no attempt has yet been made to gather and weld it together, nor to make such scientific knowledge readily available to those who could use it.

The object of this paper is to call attention to the subject, and to trace the foundation and outline of this science to the workshop. Engineering workshop processes are chiefly directed to effect the shaping of materials, but sometimes also to change their character or appearance. The machine-shop, the forge, and the foundry are occupied mainly in giving form to objects; but the hardening of steel by quenching, the harden-

*Paper read before the British Association for the Advancement of Science, Belfast Meeting. The writer is connected with the Stoughton Steel Works, Leicester, Eng.

ing of metals by pressure, and the making of alloys are examples of common processes designed to change the character or mechanical properties of materials.

Processes for changing the superficial appearance of objects I will only mention here, because some, as the polishing of metals, are more accurately to be described as methods of changing form—a polished surface being merely a surface free from minute irregularities of contour—and others, as the chemical coloring of metals and the application of paints, are branches of applied chemistry already having scientific treatment.

If then we consider only processes for changing the physical properties of materials, or for changing their form, we shall see that these two have one common origin or foundation; for processes available for changing form are wholly dependent on the physical properties of the materials. For example, processes of cutting, which constitute the chief business of the machine shop, are dependent on the hardness, plasticity, or other mechanical properties of the materials, which determine the manner of separation of the chips. In the forge the plastic property of metals is increased by heating, so that without being ruptured they may be shaped directly by pressure suitably applied. And in the foundry metals are made fluid by heat, so that the force of gravity alone is sufficient to give them the forms of moulds into which they are poured. In these and other processes the well known properties of elasticity, plasticity, tenacity, and hardness bear their part, and the study of these properties of materials is at the foundation of the science of the workshop. When the properties of any given material are known, the process most suitable for giving it any desired form may be told, and the tools for carrying out the process chosen or constructed.

The subject, therefore, divides itself naturally into these parts: Materials, Processes, and Tools.

Materials.

Of the physical properties of materials used in engineering we already have considerable knowledge, but it must be admitted that the subject has been studied much more from the point of view of the designer, who cares chiefly that his structures shall not be strained beyond the elastic limit, than from that of the mechanic who shapes materials nearly always by straining them beyond this limit. Although to the designer the plastic properties of materials are generally of little importance except as things to be avoided, to the mechanic plasticity and hardness are matters of great concern, because upon these depend most of the processes he employs in the workshop. It is especially in the further investigation of these qualities that the study of materials might be usefully extended. That the respective objects of the designer and the mechanic are not necessarily antagonistic is known in the case of the low tempering of steel, a process which raises the elastic limit and tensile strength of the material, and sometimes improves also its capacity for being cut.

The use of photo-micrography in the study of the structure of materials appears likely to add greatly to our knowledge of their properties. The valuable work of the alloys research committee of the Institution of Mechanical Engineers, on the structure and composition of alloys as affecting their strength and elasticity, might usefully be extended toward the study and improvement of their plastic properties.

Prof. Unwin, in his work on the testing of materials, deals briefly with the plastic properties of metals, and refers to papers by M. Tresca on the flow of solids, read before the Institution of Mechanical Engineers in 1867 and 1878, and which appear to be the principal contributions to our knowledge of this subject. These papers describe a number of experiments connected with the operations of forging, punching, stamping and cutting; but although full of interest and suggestion, they do not appear to have led to the full investigation of the laws which govern those various operations.

Various methods of determining the hardness of materials have been devised, and the term "hardness" has been defined as the power to resist abrasion; but the hardness of materials as determined by these tests does not appear to be always in harmony with experience when such materials are subjected to abrasive action; and much of this subject still remains obscure.

The effect of high temperatures on the mechanical properties of metals is a subject of comparatively small importance to the designer, but to the mechanic it is a very important matter, because he uses heat with the specific object of changing for the time the properties of the materials he works. Experiments have been made from the designer's point of view to determine the behavior of metals when heated—as, for example, the materials of steam boilers; and such experiments might well be extended to discover for the mechanic the way in which the hardness and plasticity of metals is affected by such temperatures as are used for changing these properties in the workshops. The invention of the Taylor-White tool steel, which is comparatively soft at ordinary temperatures, but which possesses sufficient hardness at high temperatures to do excessive duty in the form of cutting tools, is full of suggestion in this direction. The proper thermal treatment of tool steel in the process of hardening is a subject of which a more general knowledge is desirable. The researches of Sir William Roberts-Austen and others into the structure of tool steel, and the effects of annealing and tempering, form an invaluable portion of the science of the workshop.

The writings of Metcalf and Ede are not only valuable guides for the practical treatment of steel, but contain many suggestions on matters as to which more exact information is desirable—for example, the question of the expansion of steel in hardening. Makers of screw taps find sometimes that their taps expand in length, and sometimes shrink, in the process of hardening. Whether they expand or shrink seems to depend not only on the initial state of annealing, but also on their general size and proportions and the form of thread; but these matters appear to be so obscure that no general plan is followed to secure constancy of results. A simpler example is that of a steel ring, the bore of which either shrinks or expands in diameter in the process of hardening, according as the radial thickness of the ring is either great or small in relation to its diameter.

Processes.

Having completed from the mechanic's point of view the study of the materials used in engineering, together with such processes as may be employed to alter their physical properties, we come to consider processes, whose object, the chief business of the workshop, is to effect the shaping of such materials. The simplest of these processes has been used from the earliest times in the production, for example, of metal coins; and consists in taking the right amount of material, and, with suitable dies or molds, squeezing it into shape. When this process can be employed, its simplicity renders it extremely economical, while the results are sometimes remarkable for their uniform accuracy and the perfection of finish. At present this process is comparatively limited in its application, probably because its limits have never been scientifically determined. When they have been, and when materials shall have been as far as possible adapted to it, we might reasonably expect it to replace, in many instances of repetitive production, the more costly and laborious methods at present used.

An example of what may be done in this direction was recently shown to me in the United States. A straddle milling cutter, between 3 inches and 4 inches in diameter, with deep teeth on its periphery and on both faces, had been formed cold from a blank of tool steel by hydraulic pressure. It showed no sign of rupture, and was said to serve its purpose as well as any cutter milled from a solid blank. Whether or not these claims were perfectly well founded, the result itself was certainly remarkable and suggestive.

In operations of this character it has been observed that the element of time is one of considerable importance. Metals appear to behave, in varying degrees, after the manner in which it is well known that pitch behaves. If strained suddenly, it is extremely brittle; but if strained slowly, it exhibits high plastic properties, and changes its form under the action of gravity alone. Whether all metals behave in this manner, though in less degree, or to what extent they are thus influenced by time, does not appear to have been fully determined. Variations of this process of shaping metals cold by pressure are well known in the cold rolling of metals, the beating of gold, the drawing of wire, in operations like that known as "knurling," in spinning, and in the press working of sheet metals.

Some remarkable work has been done in connection with cycle-making and in other industries, in the drawing of sheet metals in the press, but the principles which should be followed to secure extreme changes of form without rupture are not commonly understood. One of the ordinary limitations of this process is the hardening of the metal under treatment. The change of structure which accompanies this hardening in various metals may, perhaps, be exhibited microscopically, and a study of the subject might lead to treatment of materials, and to the production of alloys resisting in a greater degree this tendency to harden.

When the plasticity of metals at ordinary temperatures is insufficient to permit the desired deformation without rupture, or when the force necessary for this purpose is inconveniently great, the plasticity of the metal is sometimes increased by heating it. This practice is well known, not only in the smithy, but also in the hot rolling of metals, and in the squirting of lead pipes and rod. With the remarkable process practiced by Mr. Alexander Dick, in the "extrusion" of alloys in what is specifically termed their "plastic state," every engineer is acquainted. His work suggests a large and fruitful field for scientific inquiry into the way in which the hardness and plastic properties of ordinary metals and alloys vary with temperature. Mechanics generally know little definitely upon this subject, and I am not aware that it has been studied in any complete way.

In forging heavy masses of steel, the element of time is found in practice to be of great importance. Small articles are produced satisfactorily in quick acting drop presses; large masses demand the slowly acting hydraulic press. But little information appears to be generally available as to the best relation between time, mass, form, and temperature, for any given material.

The heating of metals sufficiently to render them liquid, so that they may be poured into molds and shaped under the influence of gravity, is the business of the foundry. As I am not a foundryman, I will leave it to others to suggest such scientific instruction or investigation as would be most helpful to men engaged in that business.

The use, in casting, of force supplementary to the force of gravity has long been practiced in the casting of types for printing; and now the production of the United States by the Franklin Mfg. Co. of "finished castings" shows that here is a possibility of avoiding many of the expensive operations of the machine shop. At present, however, processes of shaping materials by direct pressure, either cold or with the aid of heat, are not the principal processes used in engineering workshops. Nor are they applicable to such materials as wood, stone, and hardened steel, which have little or no plasticity.

The chief processes of our workshops we vaguely describe as "processes of cutting," and our chief tools as "cutting tools." Of the philosophy of this subject comparatively little is known. Prof. Robert Smith's work, entitled "Cutting Tools Worked by Hand and Machine," is the only publication I know dealing with this subject in the English language, and the author will probably be the first to admit that he has touched only the fringe of a large subject. He refers to the writings of the German, Hart, who made numerous experiments to determine the best angles for tools cutting various metals. But the most complete theory of cutting action is probably one to which Mr. Boys has called my attention, and is contained in a paper by Mr. Mallock, communicated by Lord Rayleigh to the Royal Society in 1881. This deserves to be much more generally known. I am not aware if any acceptable definition of the term "cutting action" has ever been made. We understand clearly what is meant by shearing, and recognize that this plays some part in what we commonly call "cutting." For example, in the use of parting tools we know that the metal is shorn from the sides of the cut, the surfaces there being left correspondingly rough. But where the chip is removed by the end of the tool, the surfaces are left smooth, and we recognize here an action which we distinguish from shearing by calling it "cutting action."

Mr. Mallock and Prof. Smith have shown, however, that this which we call more particularly "cutting action" may be itself largely composed of shearing. They show that in turning mild steel, for example, the tool acts by compressing the material in front of it until rupture occurs by shearing within the body of the chip, and that by such intermittent action chips are sometimes removed. But this is not always so. If instead of steel we take for illustration an extremely plastic substance, such as butter, or even lead, or a substance which is both elastic and plastic, such as moderately dry cheese, we can remove chips apparently without such shearing action, because the chips are sufficiently elastic or plastic to bend or flow without rupture, and permit the passage of the tool. Again, in planing wood along its grain, the chips are not removed by intermittent shearing, but if ruptured at all are ruptured by bending.

But these various accompaniments of cutting action are not the real essence of the thing. What we recognize especially as the thing itself is the more or less perfect action of a tool edge in reaching into the material, as a boat cuts the water, to decide the plane of separation of the chip. When this ceases, when from any cause rupture occurs in advance of the cutting edge and within the body of the material, then perfect cutting action ceases; but rupture of the chip, whether it be caused by bending or shearing, and although in some cases it may be necessary to permit continued motion of the tool, is not the essential part of cutting action.

A more complete knowledge of the factors concerned would enable us to find a satisfactory answer to the question, which has been discussed among engineers, as to the respective merits of high speeds and fine feeds, and of low speeds and thick chips; and the whole question of the best forms of cutting tools for various purposes and materials might be put upon a connected and intelligible basis.

In materials such as glass, stone, and hardened steel, which have no appreciable plasticity, and which suffer only slight elastic deformation, what I have attempted to define as true cutting action cannot take place. Instead of it, we have an action composed almost entirely of that intermittent shearing which has been described, and as the result we get with such materials only ragged and broken surfaces which require further treatment to render them smooth. Moreover, for such materials, hardened steel tools are not hard enough, nor can the removal of large chips be controlled with sufficient accuracy. It is therefore necessary to take small chips, and to use harder tools in the form of abrasive materials. Abrasives in the form of natural stones, also as emery, diamond dust and other hard particles supported in metal laps, have been used for centuries; but their action appears to have been studied but little scientifically. Their use is, however, extending rapidly, but in the form of wheels and rings, in which the abrasives are held by vitreous bonds, and as the more tenacious abrasive-coated steel disc, which withstands velocities of 10,000 feet to 15,000 feet per minute. Among the exceedingly able makers of these abrasive wheels very little appears to be definitely known as to the way in which the various factors enter into their efficiency. It is known in general terms that a hard wheel—that is, one containing a large proportion of the vitreous bond—must be run more slowly than a softer wheel; also that with wheels having the same proportion of bond, one having its abrasive in finer particles behaves as a harder wheel; but it is not definitely known in what ways the coarseness of the abrasive, the strength of the bond, and the velocity of action should be related to the structure and mechanical properties of the material to be ground and to the purpose in view.

In operating on the surfaces of metals and other plastic substances, the action of an abrasive appears to consist partly in shearing off minute particles, and partly in causing the metal to flow into the cavities, as it is made to flow under a burnisher, or as plaster is laid smooth under the mason's trowel. With glass and hardened steel, which possess but little of this plastic property, the action is chiefly confined to the first mode, and has been described by Lord Rayleigh in connection with the optical polishing of glass.

At high velocities, however, it appears likely that abrasives act on all metals and fusible substances largely by heating the particles which they remove, and so, for the instant, by increasing their plasticity, permitting true cutting and burnishing actions. That particles are so softened before being removed is, of course, proved by their coming off as at shower of sparks.

In the case of metal laps charged with abrasives for grinding hard materials, it is known in general terms that the lap must be softer than the material to be ground, as a lead lap for cast iron, a cast iron lap for hardened steel, a soft steel lap for diamonds; it is generally known that the hardness of a lap must vary with the size of the abrasive particles: thus soft laps are used for polishing steel, and laps of wax or pitch for polishing glass lenses; but precisely what is the best relation of these things, as measured by the structure and mechanical properties of the material, does not appear to be known.

Recent experiments in sawing glass with diamond charged steel discs appear to show that the greatest efficiency is reached at a certain velocity. This suggests that the time element, which has been illustrated by the behavior of pitch, may have some influence in abrasive action at high velocities.

Tools.

Having founded our science of the workshop upon the study of the structure and properties of materials, and having traced to this foundation the nature of the processes used in shaping them, it remains to consider only the tools or instruments used for carrying out these processes. I will not discuss here this portion of the subject, which is more or less familiar to every one. Modern workshop appliances, although the product of long experience among practical men, are, however, far from having reached their final development. Their rate of progressive change was never greater than it is today; and nothing will assist this progress more than a fuller scientfic knowledge than that we now possess of the essential character of workshop processes. And it is for the special recognition of this branch of engineering science, which I have attempted briefly to outline, that I should like to plead.

Owing partly to the influence of our engineering schools in regarding the business of the workshop as a handicraft, and only the business of the drawing office as a science, we have in engineering works a certain social distinction and caste which, among other things, robs the workshop of many of our most cultured minds. But we must not blame the schools for not teaching what is not sufficiently known. Nor, with a system of education inseparably connected with grant-earning, can we expect many schools to teach even that part of workshop science which is already known, unless it is made a grant-earning subject. I submit that the branch of engineering science should be recognized as a grant-earning subject, and a syllabus prepared embodying as much of the matter as is already established. The science, so planted, would soon grow and yield, I believe, abundant fruit; but it will need for its growth the help of practical as well as of scientific men.

Some of the questions to which answers are wanting are known only to experienced mechanics, and do not come within the observation of the ordinary teacher or specialist in science. What is needed is, that mechanics who have questions to solve or experiences to record should make them known; that scientific men, and especially those who are practical engineers, and have facilities for experimental investigations, should give increased attention to this subject; and that those concerned in teaching engineering science should teach not only the science of design, but also this science of the workshop which shows mechanics how best to "hitch their wagons to the stars, and get their work done by the gods."

The Philadelphia Steel & Iron Co. has organized to take over as a going concern the business, plant, good will, etc., of the Ferro-Carbon Casting Co., of Frankford, Philadelphia. The new corporation is capitalized at $1,000,000, of which $300,000 is 6 per cent non-cumulative and non-voting preferred and $700,000 common. A bond issue of $300,000 6 per cents is authorized, of which $250,000 is to be issued and sold at par. The directors of the new company are J. Wesley Allison, president of the Cramp Steel Co.; Chas. M. Jesup, president of the Eastern Trust Co.; S. C. Smith, president of the Second National Bank, Phillipsburg, Pa.; A. C. Rex, Philadelphia; G. H. Meldrum, New York; W. J. Hilands, Chicago, and J. K. Caldwell, Philadelphia. The object of the new corporation is to extend the business of the manufacture of Atlas steel castings, for which there is said to be a greater demand than the present capacity of the company can supply.

PERSONAL.

John W. Gates returned from the Continent to London last week, slightly indisposed. He is now on his way to this country.

Charles A. Dann, formerly in charge of the North Works of the Illinois Steel Co., has been appointed superintendent of the Detroit Iron & Steel Co., which now has a blast furnace under construction at Delray, Mich.

W. C. Swift, European manager for Henry E. Pridmore, of Chicago, is in the United States for a stay of two months.

W. J. Totten, St. Louis manager of sales for the Carnegie Steel Co., Illinois Steel Co., American Steel Hoop Co., and National Steel Co., announces the appointment of Wm. B. Weston as his assistant. Mr. Weston has been the representative of the above companies in Mexico, and goes to St. Louis to succeed John R. Scott, recently made sales manager at New Orleans.

S. V. Huber, consulting engineer, of Pittsburg, sailed for Germany last week. Before returning he will visit the exposition at Düsseldorf.

J. A. Smith, Jr., formerly connected with the New York office of the American Sheet Steel Co., has been appointed sales agent for the Pittsburg District, to succeed F. C. Milliken, resigned.

Henry Phipps, Jr., arrived in Pittsburg last week and will remain in that city for about a week. About the middle of November he will accompany his family to India.

A. C. Case, formerly credit manager of the Carnegie Steel Co., and for the past year president of the American Cotton Co., has resigned, as has H. E. Tener, Jr., formerly connected with the Carnegie Steel Co., and vice president of the cotton company for the past year. Both will continue as members of the board of directors.

Orran W. Kennedy, general superintendent of the plants of the H. C. Frick Coke Co., in the Connellsville region, has accepted the Congressional nomination on the Democratic ticket in his district. He resides at Connellsville, Pa.

Charles T. Schoen, formerly president of the Pressed Steel Car Co., of Pittsburg, has sent out cards announcing the removal of his business office from Philadelphia to 170 Broadway, New York.

Lord Charles Beresford, of the English Admiralty, visited the plant of the Sharon Steel Co., at Sharon, Pa., last week.

Owing to the press of other business, H. A. Croxton, of Massillon, O., has resigned the presidency of the Field-Croxton Iron Co., and Robert Field, of Cincinnati, has been made president.

C. D. Hudgens, general manager of the Columbus Machine Co., Columbus, O., has accepted the position of general manager of the American Radiator Co. at Buffalo, N. Y., and will remove to Buffalo about Nov. 1.

George W. Westinghouse, founder and head of the Westinghouse interests, was in Pittsburg this week, attending the annual meeting of the Westinghouse Air Brake Co.

Charles H. Booth, of the Lloyd Booth Co., of Youngstown, O., one of the constituent companies of the United Engineering & Foundry Co., of Pittsburg, returned to Youngstown, O., this week from Europe, where he has been with his family since June.

C. H. Halcomb, formerly president of the Crucible Steel Co of America, was in Pittsburg this week. He denied the report that he is contemplating the erection of a crucible steel plant in the Pittsburg district.

The Weinman Machine Works, Columbus, O., manufacturers of steam pumps, will begin next month to erect a three-story brick building, 45x81 feet, which will provide facilities for taking care of their increasing business.

A plant for the manufacture of iron trolley poles is to be erected in Youngstown, O., near the mills of the Youngstown Iron, Steel & Tube Co.

The new plant of the Buckeye Malleable Iron & Coupler Co., Columbus, O., will be completed and ready for operations Oct. 15.

HOUSING BLAST FURNACE STOCK YARD AND BINS.

One of the most notable contracts for blast furnace equipment placed in the present year is that just awarded the Wellman-Seaver-Morgan Engineering Co., of Cleveland, for the stock handling plant of the Union Steel Co. at Donora, Pa. This plant will be a radical departure from anything that has hitherto been done in ore storage and handling plants for large blast furnaces. All of the ore, both in the storage stock piles and in the bins, will be housed and protected from the weather, and arranged so that in the winter, by means of artificial heating, the temperature in the storage plant will not be less than 45 degrees, thus enabling the ore to be as economically handled in the winter as in the summer months. This arrangement will enable the blast furnace to be charged uniformly the year around, which will tend to increase the capacity of the furnace materially.

In general, the plant will consist of an immense stock house 600 to 800 feet long, 240 feet wide in the clear, 70 feet high underneath the roof trusses, and capable of storing 400,000 to 500,000 tons of ore, and sufficient coke and limestone for the operation of the plant. The ore is brought from the lake ports to the stock house during the navigation season and dumped either directly from the cars into the bins, or transferred directly to the stock piles. The plant is to be equipped entirely with electrically operated machinery.

Throughout the season of freezing weather it will not be necessary to have the building enclosing the stock yard open at all. Two 15-foot blowers will be employed in the heating system, which will be of the Sturtevant type. The air, passing over coils in which is contained either live or exhaust steam, will be driven through a tunnel underneath the bin system. In addition to protecting the ore from snow and rain, the plan of housing it, together with the heating arrangement, will result in a drying of the ore that will be highly advantageous in facilitating regular and even furnace operation. The traveling crane of 240-ft. span, commanding the ore yard, will run on the girders of the building, and will carry a 10-ton bucket of ore.

The Jones & Laughlin Steel Co.

(Special Telegram.)

PITTSBURG, Oct. 8.—A meeting of the board of directors of the Jones & Laughlin Steel Co. is being held today for the purpose of authorizing a bond issue of $10,000,000. There is no opposition to the issue on the part of any of the directors. The new converter recently installed, having a capacity of 500 tons daily, will be placed in operation this week.

The Mesta Machine Co., of Pittsburg, whose plant is located at West Homestead, Pa., has purchased two acres of land adjoining the present plant. The additional property will be used for the purpose of making extensions to the present departments. Negotiations are now pending with the American Bridge Co. for the purchase of the property upon which the plant of the Shiffler Bridge Co. is located. If this property is secured an entirely new foundry will be built 1,000 feet in length. It is also probable that some of the company's present property along the river front will be sold to the Carnegie Steel Co. as it is very much desired for the new angle mill that will be erected by the Carnegie Steel Co. shortly.

The new foundry the Brown & Sharpe Mfg. Co. is erecting at Providence, R. I., is expected to be ready for occupancy by the end of this year. The buildings now going up cover an area 380x160 feet. Ultimately the foundry department will be twice as large and will cover 360x360 feet.

The bar mill of the Youngstown Iron Sheet & Tube Co., Youngstown, O., has resumed operation after a short shut down on account of a difference regarding wages. The matter was satisfactorily adjusted.

The American Spiral Spring Co., of Pittsburg, contemplates changing from a partnership to a corporate company.

RE-VALUATION OF IMPORT STEEL MAY PUT AN END TO IMPORTATIONS.

The action of the customs appraiser at Philadelphia, Pa., in marking up the valuation of a consignment of steel slabs from Germany to a New York concern, has resulted in temporarily preventing additional contracts for the German product. Until a definite decision has been reached in this case, it is not probable that the steel importing agents will take any additional contracts except at the owner's risk so far as the present duty is concerned. While the slabs were invoiced at a much lower price, the customs appraiser took it upon himself to mark them up to 97 marks, the present selling price in the German market for consumption there. The reason given was that the market price for steel in Germany when the shipment was made fixes the value at which the goods are dutiable. Heretofore appraisement was made according to the invoice. In this instance the marking up of the steel resulted in advancing the duty from 3c to 4c per pound, or $6.72 to $8.96 per long ton, steel at 1c a pound or less carrying the former duty. In addition the tariff provides that "when the value at which goods are entered at the custom house is advanced by the appraiser, an additional duty is incurred of 1 percent of the total appraised value for each 1 per cent that such appraised value exceeds the value declared in the entry."

The New York concern receiving this consignment has applied for a re-appraisement, and the matter will be brought before one of the general appraisers in New York. Should his decision sustain that of the local appraiser in Philadelphia, the importer then has two days in which to appeal from this decision, when the matter is brought before the general board of appraisers, from whose decision there is no appeal except by resorting to the courts.

At none of the other ports has this question yet been raised, the appraisal being made on the invoice entirely. However, the action of the Philadelphia appraiser may be sustained and become the rule. Such a decision will not affect pig iron and finished steel products, as on these the duties are specific.

Steel slabs and billets are selling in Germany at present at from $22.50 to $23. On export steel, however, a reduction of from $2.50 to $3 is made, so that the selling price will fix the duty at $6.72 per ton instead of $8.96. The final decision in this case will be awaited with much interest and should the Philadelphia appraiser be sustained it will mean a loss of thousands of dollars to concerns that are now importing foreign products.

The Shenango mill of the National Steel Co. at New Castle, Pa., was shut down this week for repairs. Notices have already been posted, however, announcing that operations will be resumed next week.

Temporary repairs have been made to the boilers at Genesee Furnace, Charlotte, N. Y., and it is now turning out about 100 tons of iron per day, which is about half of its capacity.

N. A. Christensen has opened an office in the Herman Bldg., Milwaukee, and will have exclusive charge of the sale of air compressors manufactured by the Christensen Engineering Co., of Milwaukee, Wis.

Great activity is reported in the finished iron and steel trade and among furnaces in Alabama. The Southern Car & Foundry Co. has started its rolling mills at Anniston, Ala., on double turn. The Tennessee Coal, Iron & Railroad Co. is repairing two furnaces. The small furnace of the Williamson Iron Co. is nearly ready for operation. The Birmingham furnace of the Sloss-Sheffield Steel & Iron Co., which had been out of blast for repairs, has resumed.

The Cramp Steel Co., Ltd., which has recently purchased the plant of the Central Steel Co., Indianapolis, and will re-erect it at Collingwood, Ont., is offering preferred stock at par, with a 50 percent bonus of common stock, for the purpose of paying the cost of construction. The promoters are also promoting the Philadelphia Steel & Iron Co., mentioned elsewhere in this issue.

PITTSBURG FOUNDRYMEN'S ASSOCIATION.

The annual meeting of the Pittsburg Foundrymen's Association was held at the rooms of the Engineers' Society of Western Pennsylvania, Pittsburg, on Monday evening, Oct. 6. Officers for the ensuing year were elected as follows: President, B. J. Thomas, of the Sterritt-Thomas Foundry Co.; vice president, A. V. Slocum, of the Keystone Car Wheel Co.; treasurer, Philip Mathes, of the Britten-Mathes Co.; secretary, F. H. Zimmers, of the Union Foundry & Machine Co. The executive committee consists of the following members: Wm. Yagle, John McClaren, B. D. Fuller, E. A. Kebler and J. S. McCormick.

Methods of making the meetings of more value to the foundrymen were discussed at length, and it was decided to appoint a program committee whose duty it will be to provide topics for discussion and papers for all the meetings. A committe of five was appointed consisting of A. O. Backert, chairman; A. V. Slocum, S. H. Stupakoff and the president and secretary as ex-officio members. The secretary was also instructed to secure the names of all the heads of departments of the foundries in the Pittsburg district for the purpose of urging them to attend the monthly meetings regardless of their membership. The foundrymen will be urged to secure the attendance of the heads of their departments and every effort will be made to secure a better representation of the foundrymen at these meetings. After the meeting adojurned lunch was served. The following were in attendance: J. C. Clark, Pennsylvania Casting & Machine Co.; Mr. Fox, Thomas Carlin & Sons; Mr. Townsend, Thomas Carlin & Sons; C. A. Stroh, Pittsburg Locomotive Works; T. E. Malone, J. S. McCormick Co.; William Yagle, William Yagle & Co.; S. H. Stupakoff, Fullman Co.; J. S. McCormick, J. S. McCormick Co.; Mr. Jones, Seaman-Sleeth Co.; Mr. Wallace, Pennsylvania Casting & Machine Co.; E. A. Kebler, Mathew Addy & Co.; Mr. Nichols, Seaman-Sleeth Co.; A. V. Slocum, Keystone Car Wheel Co.; George Knotts, United Engineering & Foundry Co.; F. H. Zimmers, Union Foundry & Machine Co. and A. O. Backert, *The Iron Trade Review.*

Preparing for Large Export Trade in Wire Products.

The American Steel & Wire Co. has just closed negotiations for the purchase of 30 acres of land having a river frontage of 2,200 feet at New Orleans, La. The price paid for the property is estimated at $200,000. Immense docks and warehouses are to be built on this site and New Orleans is to be made a great distributing point for the products of all the constituent companies of the United States Steel Corporation. Products will be transported by water from the mills of the company in the Pittsburg district to these warehouses. From this point shipments will follow to countries in South America, and it is probable with the completion of the Isthmian canal this will be a central distributing point for shipments to the oriental countries.

The Columbus Bolt Works, Columbus, O., have just completed a four-story brick building to be used as offices and warerooms. The dimensions are 45x100 feet and the capacity 1,000 pounds to the square foot.

Settlements of the mine strike in the Kanawha Valley, W. Va., will result in 4,000 men returning to work. The diggers are given a nine-hour day and the officers of the United Mine Workers claim that other concessions have been granted, but these will not be known until the agreements are formulated.

The Hollingshead & Blei Co., Chicago, has been incorporated with the object of handling all kinds of iron and steel, and among other materials will deal in bar iron, black and galvanized sheets, hoop and band iron, large and small rivets. The offices will be at 218 La Salle St.

A TESTIMONIAL TO GEORGE G. McMURTRY.

On Saturday, Oct. 4, President George G. McMurtry, of the American Sheet Steel Co., one of the constituent companies of the United States Steel Corporation, was most pleasantly surprised with the gift of a handsome punch bowl from the employes of the company's plant at Vandergrift, Pa. The town was gaily decorated in honor of the event, and when the train bearing Mr. McMurtry and his party reached Vandergrift it was met at the station by the entire population who extended their visitor a hearty welcome. On behalf of the workingmen in the Vandergrift mills, the bowl was presented by Joseph T. Dougherty, a roller in the sheet mills. After expressing his thanks and appreciation of the magnificent gift, Mr. McMurtry had it announced that each of the six churches in the city would receive a pipe organ without regard to creed or denomination.

The bowl presented to Mr. McMurtry is a massive piece of repousse and model work. It is about 16 inches high and 18½ inches in diameter and has a capacity of 20 quarts. The outside is richly ornamented, there being several medallions encircled by wreaths of laurel and ivy, and further enriched by bunches of grapes that are modeled in full relief. The bowl itself is supported upon four artistic columns. Within the various medallions are shown a finely chased portrait of Mr. McMurtry, under which is the inscription: "The founder of Vandergrift. A lovable character and possessor of many noble qualities, whose generous deeds have proven him a true friend of the workingman;" a view of Vandergrift clearly and plainly chased in silver; the site of Vandergrift in 1895; the present great mills there, and four scenes showing the processes of casting, galvanizing, annealing and blooming. Underneath the bowl and between the supporting columns is a perfectly modeled miniature sheet mill with the workmen operating it in their natural positions, while putting a sheet of steel through the rolls. The figures of the men are carefully modeled from life and the whole scene is a wonderfully true representation of the operation which it depicts. On the base of the whole structure upon which the columns rest are ornamental shields, bearing the Caduceus, the rod of Mercury, and symbol of commerce, and branches of laurel suggesting the success of the recipient during his business career. The inscription in bold letters encircling the top of the bowl reads: "Presented to George G. McMurtry by the employes of the Kiskiminetas valley mills. A ladle of appropriate size and very richly chased, accompanies the bowl. Both are gold lined and the entire work was designed and executed by Tiffany, requiring several months for its completion.

President McMurtry, to whom the building up of Vandergrift has been a life ambition and the maintenance of close and cordial relations with the employes of his company there, a matter of special pride, went to Pittsburg as a young man. He started with Jones & Laughlins, Ltd., later was identified with James Wood & Co., and after spending several years in nut and bolt manufacture in the firm of Charles & McMurtry he was called to take charge of the Apollo Iron & Steel Co., with works at Apollo, Pa. This was in 1886. The name of the company was chosen by Mr. McMurtry. It had been the Volta Iron Co. Under his direction the mill was remodeled. Additions came, and at length the necessity of establishing a new plant. The model town of Vandergrift was the result, and both the industry and the town life have become far famed, while the founder is properly regarded as one of the ablest and most sagacious of American steel manufacturers.

The American Steel Foundries, 74 Broadway, N. Y., announce that on and after Oct. 1 all the works of its constituent companies except those of the American Steel Casting Co., which for the time being continues its business as heretofore, will be operated by the corporation and the business done in its name. It is stated further that nearly all those who were prominently connected with the various companies are closely connected with the new corporation.

NEW BILLET MILL AT YOUNGSTOWN.

In our issue of last week we presented a plan view and description of the Republic Iron & Steel Co.'s billet mill on the property formerly owned by the Brown-Bonnell Iron Co., of Youngstown, O. The omission from that description of a number of half-tone views of this plant made it quite incomplete, and these are given below, together with some additional details. The billet mill has been in operation since April, and the Bessemer converter department and blooming mill since September, 1900. The capacity of the Bessemer works will be enlarged, as heretofore announced in these columns, so that the billet mill will be furnished blooms enough to permit of operating it to its full possibilities. The two 5-ton converters will be replaced by two 10-ton converters, and instead of the 32-inch blooming train a 40-inch train will be installed. Additional blowing engines to be furnished by the Allis-Chalmers Co. are to be provided. These will have 46 and 88 by 60 inch steam cylinders, while the air cylinders will be 76 inches diameter and 60-inch stroke. These improvements will give the billet mill ultimately a capacity of 1,800 tons a day.

The billet mill design and construction were entirely in the hands of S. V. Huber & Co., of Pittsburg, who have patents covering a number of features. The mill is so located in relation to the Bessemer plant that the bloom from the blooming mill of the Bessemer plant is conveyed by means of roller tables directly into the billet mill. The billet mill, of which a number of views are given in this connection, consists of three separate rolling mills. The first mill is a 26-inch semi-continuous mill, and is used for rolling the bloom into 4-inch or 3-inch billets. The second mill is a continuous billet mill, which receives the 3-inch billet from the semi-continuous mill and rolls it into 1½-inch, 1¾-inch, 2-inch, or 2¼-inch billets. The third mill is a tandem mill, and is used for rolling flat bars from slabs furnished by the blooming mill.

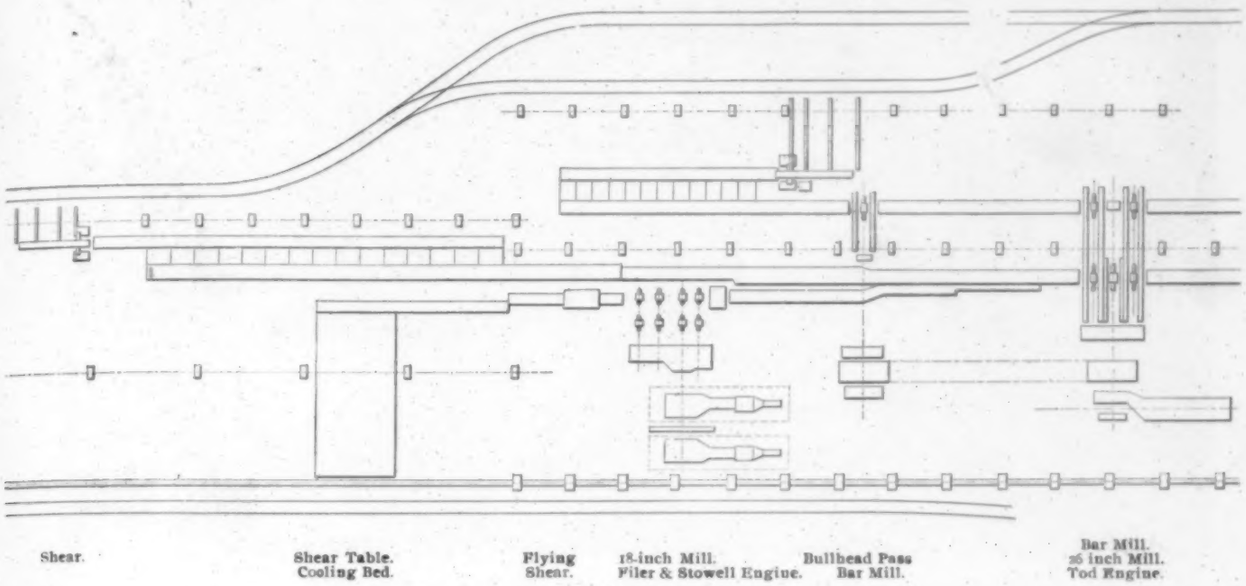

Shear.
Shear Table. Cooling Bed.
Flying Shear.
18-inch Mill. Filer & Stowell Engine.
Bullhead Pass Bar Mill.
Bar Mill. 26 inch Mill. Tod Engine.

FIG. 1.—GENERAL PLAN OF BILLET AND BAR MILLS OF REPUBLIC IRON & STEEL CO., YOUNGSTOWN, O.

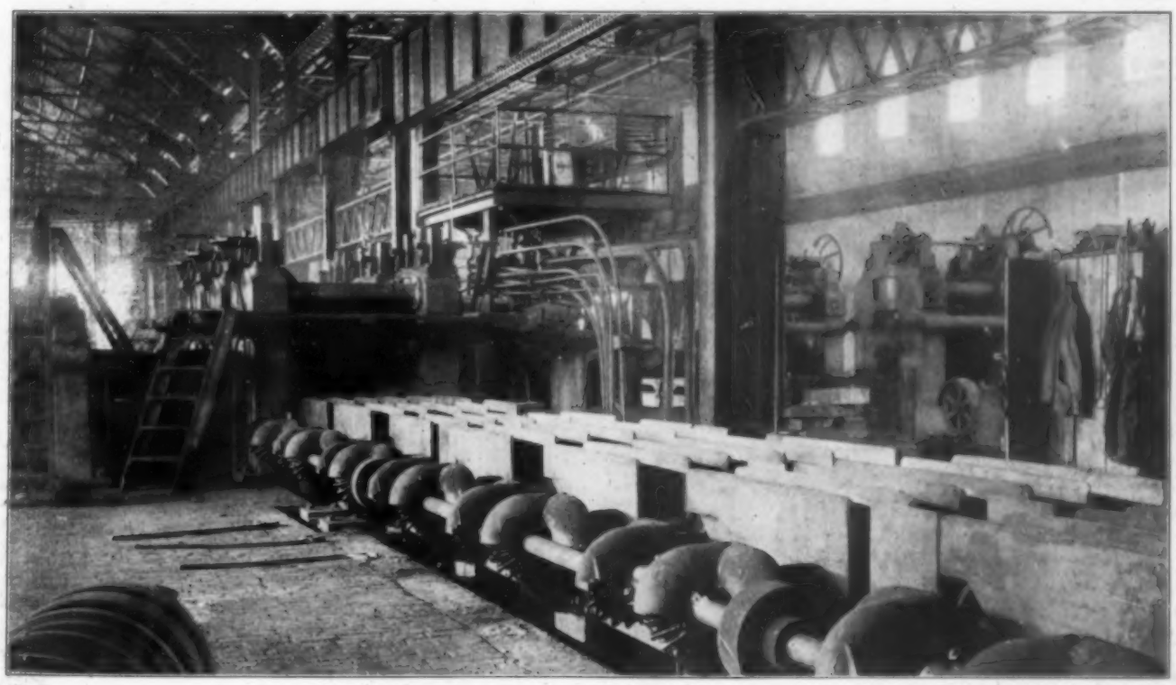


FIG. 2.—FRONT OF 26-INCH MILL. ROLL TABLE AND MILL.

The 26-inch semi-continuous mill consists of three stands of two-high rolls. The first and third stands of these rolls rotate in the same direction, while the middle stand of rolls ro-

tates in the opposite direction. This mill is driven by a tandem compound engine, furnished by the William Tod Co., of Youngstown, O. The bloom rolled in this mill receives two continuous passes when running forward, and a single pass when running backward. To roll a 4-inch billet from a 7½-inch bloom, the bloom has to pass through the mill three times. To roll a 3-inch billet from the same bloom, the piece has to travel through this mill five times. Automatic tables located in front and back of this mill, and provided with specially designed manipulators, take care of the proper handling of the material being rolled. Hydraulically operated stops and switches convey the 4-inch billet or 3-inch billet down on to the shear table located in line with the 26-inch mill, or deflect the 3-inch billet into the 18-inch continuous mill, where it will be rolled into a small billet. The shear table in connection with this 26-inch mill consists of a receiving table, cooling bed and shear table. At the end of the shear table is located a Mackintosh-Hemphill steam shear, and beyond this shear are the scrap conveyor and hydraulically operated billet conveyor for loading billets into cars.

The 18-inch continuous mill consists of four stands of rolls driven by a cross-compound engine, built by the Filer & Stowell Co., of Milwaukee. This mill is provided with passes to roll 1½-inch, 1¾-inch, 2-inch and 2¼-inch billets. Beyond this mill, and in line with it, is located an Edwards flying shear, which will shear the billets coming from this mill into 15-feet or 30-feet lengths. The billets, after being sheared, pass on to a skew table, where they are assembled side by side, and then pass on to a table in front of the cooling bed, whence they are pushed on to the cooling bed. From the cooling bed the billets are loaded into cars.

FIG. 3.—GUIDE RUNWAYS TO 18-INCH MILL.

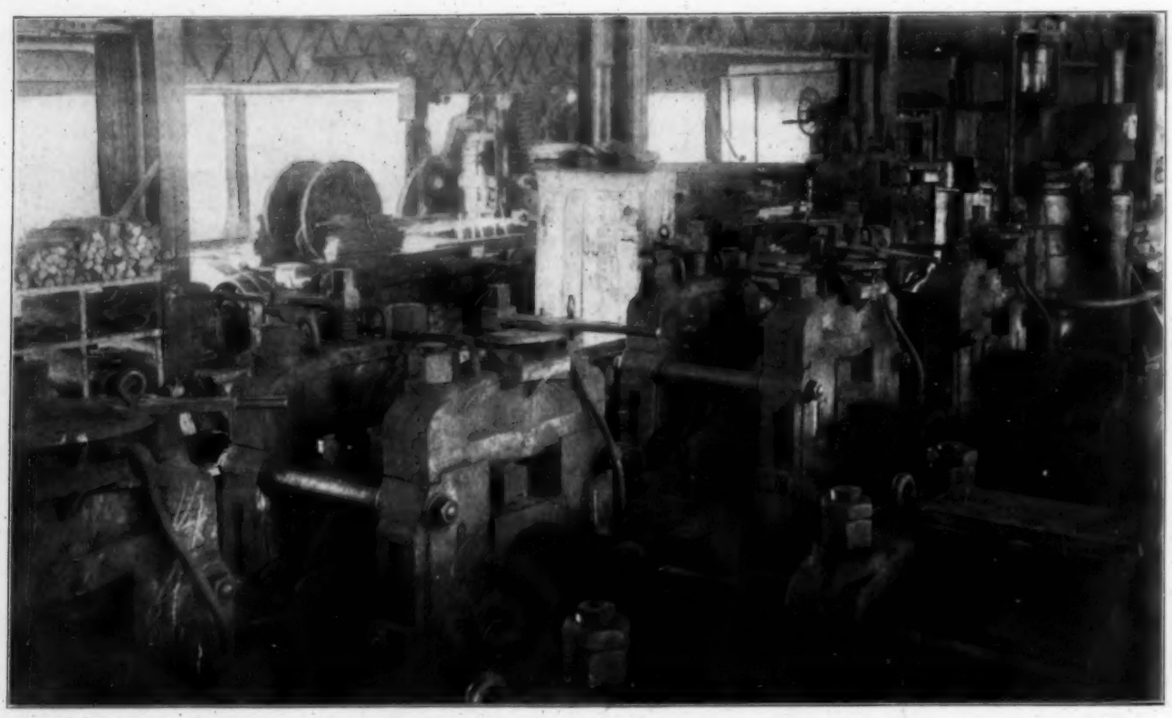


FIG. 4.—18-INCH MILL LOOKING FROM PLATFORM.

When it is desired to roll a thin bar, the slab coming from the blooming mill is transferred in line with the bar mill. The latter is driven by the William Tod engine mentioned above. The first two stands of rolls of this bar mill are so arranged that the bar may receive two or four passes, in accordance with

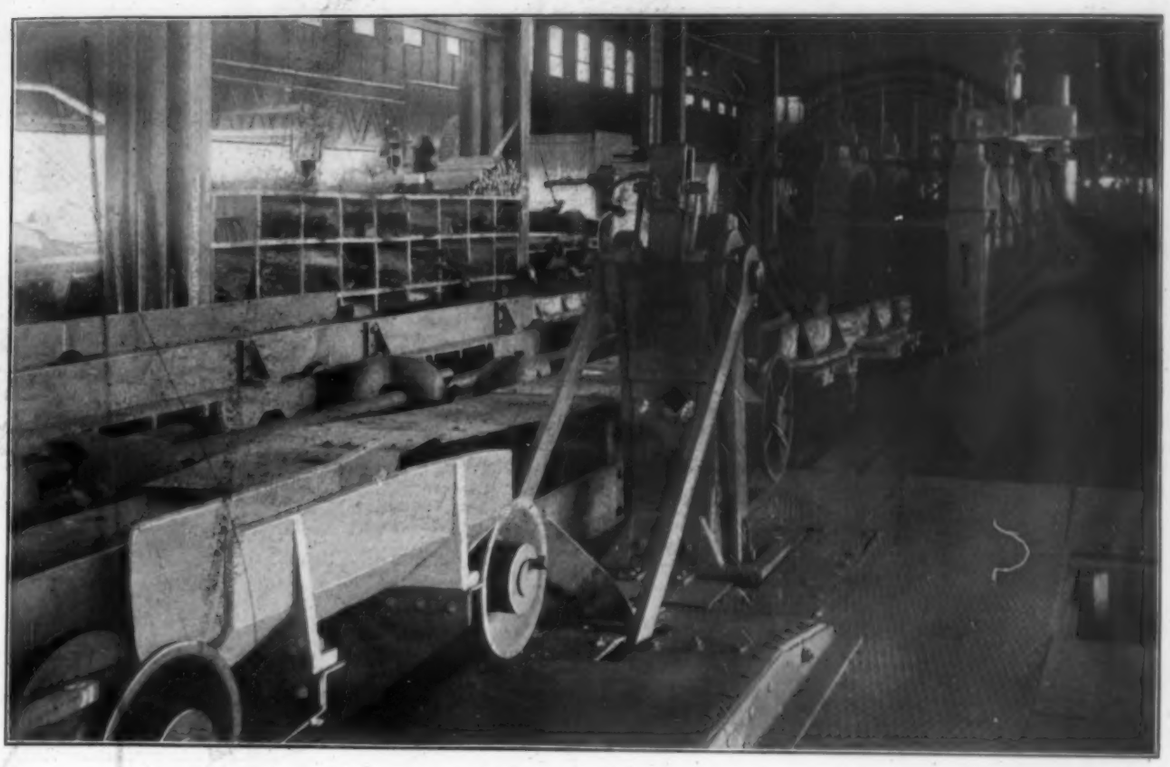


FIG. 5.—EDWARDS FLYING SHEAR.

the width of the bar. After the bar has passed through the bullhead pass it runs out on to a receiving table, from which it is transferred to the shear table. The Mackintosh-Hemphill shear is located at the end of the shear table. Beyond the shear are provided a scrap conveyor and mechanism for loading the sheared bars into cars.

Details of a 6,000-H. P. Engine.

The Filer & Stowell engine referred to above is rated at 6,000 h. p. when running at 65 turns per minute with a steam pressure of 140 pounds. The accompanying plan and sectional views, with the details below, are from the *Engineering News*.

The high pressure cylinder is 44x60 inches and the low pressure 82x60 inches. The frame, with main bearing and guides, is formed in one great casting, 26 feet 2 inches long, and weighing about 45 tons. No legs or pedestals are used, the entire frame forming a flat bed-plate with a continuous bearing on the masonry foundation. The piston rods are of forged steel 9 and 11 inches in diameter. The piston rods are threaded to screw into the crossheads and the usual jam nuts are provided for locking. In addition the crossheads are split where they embrace the rods and clamping bolts are provided to tightly clamp the threaded parts of the rods. The crossheads are of cast steel with independent steel shoes top

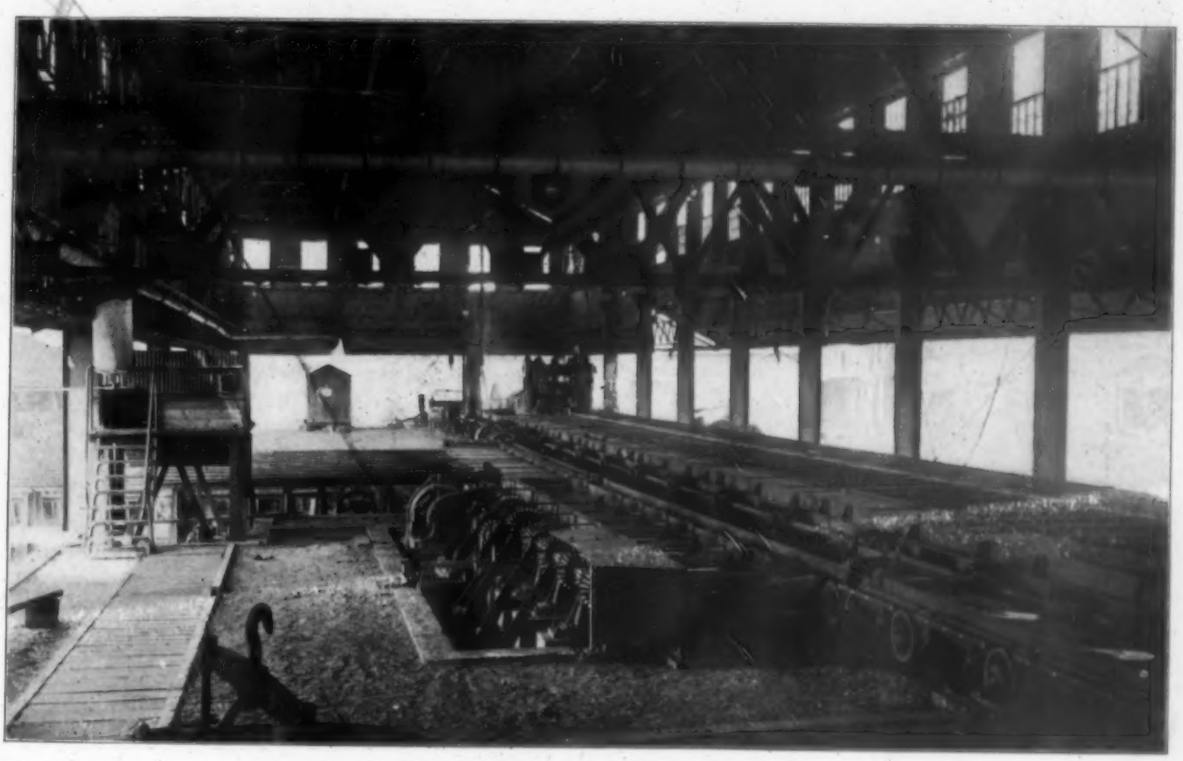


FIG. 6.—VIEW OF SKEW TABLE, LOOKING AT COOLING BED.

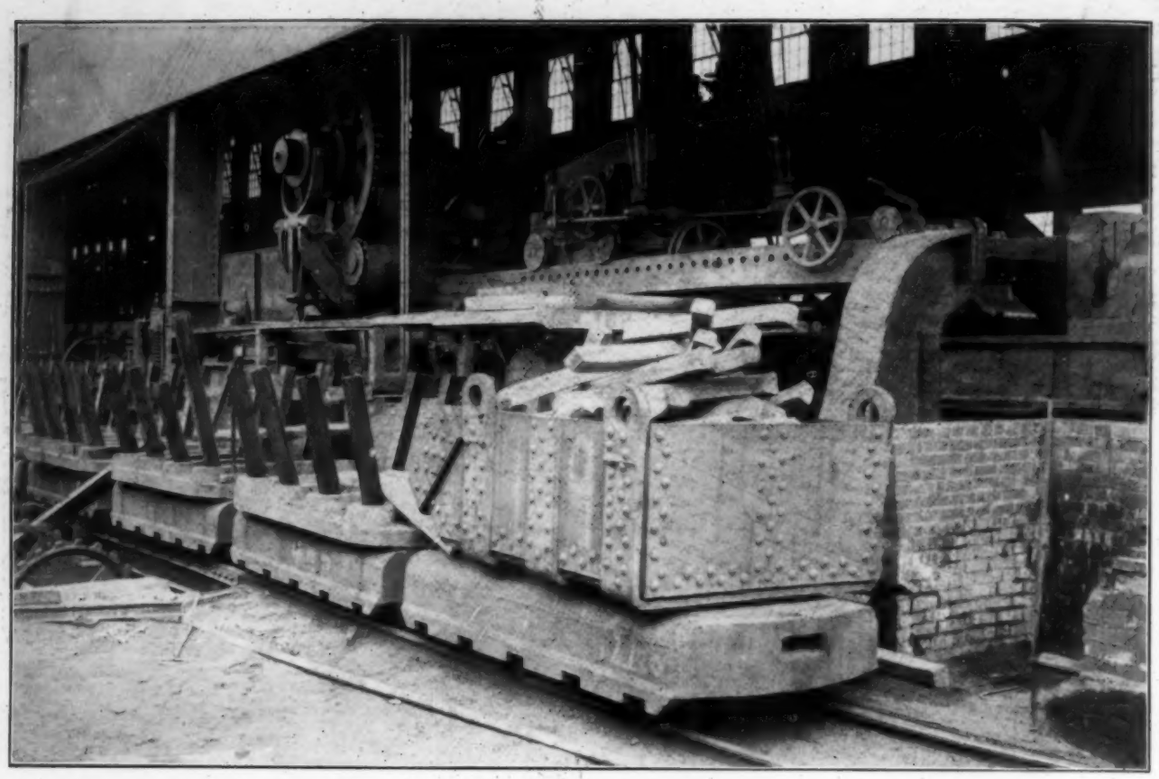


FIG. 7.—THE BILLET PUSH-OFF.

and bottom, the shoes being turned to radius of 38 inches to fit the board guides. The shoes are faced with 7-16 inch babbit metal. In order to prevent the great weight of the pistons wearing and scoring the cylinders, the piston rods are extended so as to form tail rods which are provided with outer bearings to carry the weight. The pistons and piston rods are thus supported on the cross-heads and tail rod slippers. The high-pressure piston is of cast steel with double walls; the low pressure piston is also of cast steel, but of single thickness. The connecting rods are 14 feet center to center. The crosshead pin of the low pressure cylinder is 12 inches in diameter, and the crank 23 inches. The high pressure crank is 14 inches diameter. The crankshaft is made of double refined hammered iron, and is 20 feet 6 inches long, 23 inches diameter at the low pressure crank, 26 inches diameter at the wheel fit and has two bearings 25x43½ inches. There are two

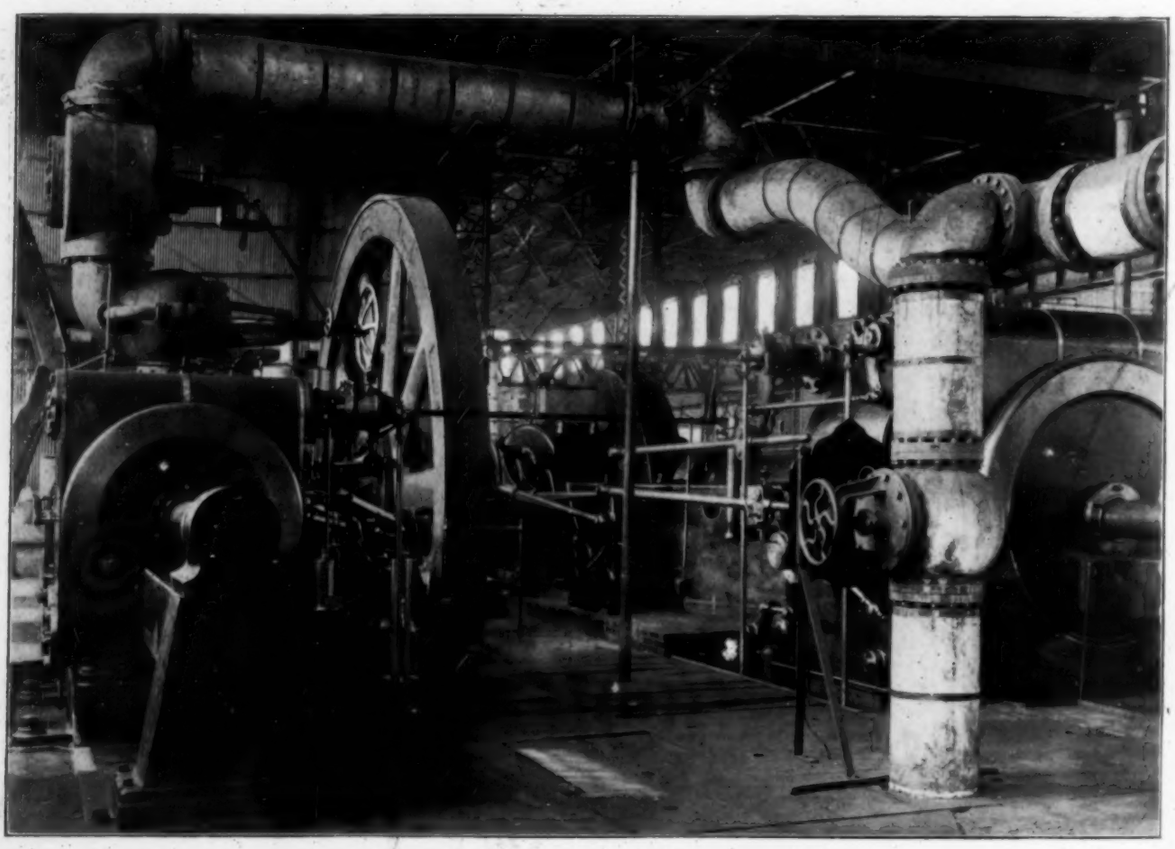


FIG. 8.—FRONT VIEW OF 6,000-H. P. FILER & STOWELL ENGINE.

keyways in each crank and two in the wheel hub. The fly-wheel is 24 feet in diameter, 19 inches wide on the face and weighs 150,000 pounds. It is of the "built-up" form and consists of ten segements, each carrying a spoke. The segments of the rim are held together by steel links of the "dumb-bell" pattern shrunk into recesses in the sides. The valves are of the Corliss pattern and are operated by two eccentrics on each cylinder. The eccentrics are 44 inches diameter and 7 inches

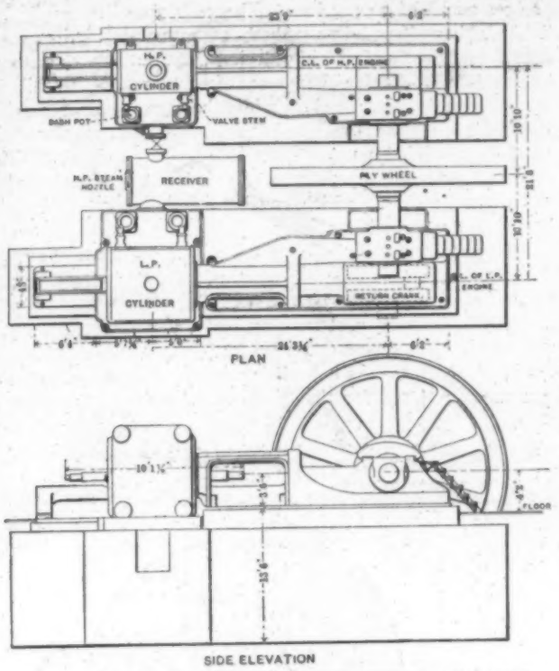


FIG. 9.—6,000-H. P. FILER & STOWELL ENGINE. PLAN AND ELEVATION.

face. The throw is 10⅛ inches for the steam and 11½ inches for the exhaust on the high pressure side, and 13⅛ inches and 13¼ inches on the low pressure side.

LAKE SUPERIOR IRON MINES.

During September ore shipments out of Minnesota were 2,026,694 gross tons, compared with shipments the same month last year of 1,557,723 tons. The increase of the Great Northern road in the ore trade, as shown by these monthly reports,

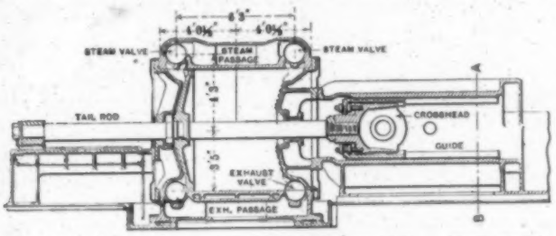


FIG. 10.—6,000-H. P. FILER & STOWELL ENGINE. SECTION OF CYLINDER, PISTON AND CROSSHEAD.

is surprising to any one who may not have followed Mr. Hill's efforts to corral ore lands all along the Mesabi range. Many of the mines along his road that are under contract to ship over the Great Northern are not yet operating, or if shipping are in but a small way. The road in another year will be one of the very largest shippers of the lake region and will continue to increase for some time. There is an immense amount of ore in lands controlled by Hill, and no one can get them who has not tonnage to give in exchange and all leases carry with them the provision that all ore shall be shipped over the Hill road. Most of them also carry the proviso that in case any reductions made in rail rates to the lake there shall be added to the royalty paid Mr. Hill a sum similar to the reduction of royalties.

The Donora Mining Co., which is the mining branch of the Union Steel Co., of Pittsburg, has dropped its option on what is known as the "Holman forty," in section 21, T 56 R 24, where the company has been working for some time. This has been the most careful and exhaustive exploration yet made on the western Mesabi, and it has shown that the ore there, at least on this property, is not what has been supposed by many as to grade. The Holman ore has been subjected to exhaustive washing tests by the Donora company, to take out the free silica, and from 23 to nearly 30 percent has been washed out, leaving about 75 percent of the ore running from, say 50 to 58 percent. In view of these facts, and of the further fact that all washings must be done during the shipping season, entailing a large and costly plant, the company has decided, it is stated, authoritatively, to abandon the option. The option on the Buckeye, which was held by M. L. Fay, has also been dropped. The Buckeye lies in section 36, of the township west of the Holman, and about half way between the latter property and the Mississippi river.

Explorations are to be carried on during the winter on the Vermillion range by half a dozen new interests, among which may be the Cleveland-Cliffs Iron Co. All this work will be diamond drilling. The same class of work may be done in a rather extensive way on the Canadian side of the boundry, in the Atikokan and Hunter's Island districts.

The Cypress Mining Co. has been formed of Duluth and Cleveland ore men to operate a mine to be opened west of Hibbing, belonging to the Great Northern road. It will be a shipper next year.

The Shenango mine is having trouble with its shafts, and a third is now being sunk. The first was abandoned on account of quicksand, and the second was successfully sunk to a first level, but in shifting the sand came in so fast that it was abandoned. The over burden of earth is not thick and it has been thought best not to go to any elaborate trouble to go through the sand, but to sink a new shaft. The mine contains a large amount of fine ore, good both chemically and physically, and most of the deposit lies under a large swamp.

The Tobin mine, under exploration by Corrigan, McKinney & Co., is showing up well, and there are indications to show that it may become one of the larger properties of the Menominee range.

A three-sixteenths interest in the recent find in section 4 T 58 R 16, Mesabi range, of which the Duluth papers have had considerable to say, has been sold at $6,500. It is needless to state that the reports of many million tons found there are incorrect.

The Breitung estate, which is exploring the old Pioneer Iron Co. lands at Negaunee, is reported to have found some ore there and to be very much pleased with the outlook. These are the lands that the Cleveland-Cliffs Iron Co. tried to hold through its ownership of the Pioneer Co. under a lease that provided that all ore found there and smelted in Marquette county should be royalty free. The only thing that prevented the Cleveland-Cliffs Iron Co. from carrying out its plans was the expiration of the charter of the Pioneer Iron Co., the court holding that its successor, the Cliffs Iron Co., had no succession of rights granted the Pioneer Co. in that instance. The Breitung estate is also exploring the New York hematite property, where ore was once reported to have been found at a considerable depth.

The building improvements at the Hartford mine, Marquette range, will soon be completed. Work on the boiler house is finished and boilers installed.

Mining operations at the South Jackson mine, Marquette range, have been suspended for the season after 15,000 tons had been mined and shipped to fill a special order.

The Minnesota state board of equalization has decided not to change the assessment of the iron mines on the Mesabi range made by local officials.

The Donora Mining Co. has made a discovery by test pits on lands of the Pittsburg & Lake Superior Iron Co. adjoining the Platt mine property, Marquette range. The indications are that there is a large deposit of ore and an analysis of samples taken thus far shows it to be of better quality than anything yet found on the Cascade range. Further exploration of the property will be vigorously pushed.

The Southern Car Wheel Iron Co., Tallapoosa, Ga., which started the Tallapoosa furnace Sept. 1, is making charcoal iron exclusively, both car wheel and malleable.

CHRISTENSEN MOTORS AND GENERATORS.

The Christensen Engineering Co., of Milwaukee, has placed upon the market complete new lines of "Ceco" electrical machinery, including direct current motors and generators, alternators and transformers. For several years this company has been manufacturing electric motors for driving air compressors used in connection with the Christensen air brake equipments on electric cars. More than 6,500 of these motors are in service. The company has also built a large number of motors of various capacities for driving air compressors used in general commercial service, and all the motors for driving machine tools and shafting in its own works. Some time ago it was decided to increase the company's manufacturing facilities and to develop a complete line of electrical machinery of high grade. The company is now prepared to build machines up to 1,500 k. w. in capacity, suitable for general power, railway or lighting service.

The line of "Ceco" motors known as Type C. E., ranging in capacity from 2 to 50 h. p., is illustrated herewith. These motors are made in three styles, open, semi-enclosed and enclosed. The standard styles are belted, but any motor can be geared or direct connected to the driven machine or shaft. The C. E. motors are for general service in industrial establishments. The frame or magnet yoke to which the poles are secured is cylindrical in shape. It is composed of a single steel casting. The bearing brackets are secured to the frame by bolts. The terminals are mounted on top of the frame where they are not liable to be accidentally touched, but where they are readily accessible in case it is desired to change the connections in order to reverse the direction of the motor. The two bearings are supported by two end brackets, which are identical and interchangeable, so that the motor is symmetrical and pleasing in appearance. The semi-enclosed style is the same as the open, but with the addition of four perforated malleable iron cover plates. The enclosed style is the same as the semi-enclosed except that the cover plates are solid instead of perforated. Either style of cover plates will fit into the open style motor, consequently the same motor may be used as open, semi-enclosed or enclosed.

The field poles are built of laminated sheet steel, thereby avoiding eddy current losses. The larger machines have four poles, and the smaller sizes are built with two only, thus permitting the use of a commutator that can be insulated satisfactorily. The poles are bolted to the yoke, and the pole is easily removable without disturbing the armature.

The field winding is composed of machine formed coils wound by automatic machinery. Any field coil can be removed without disturbing the armature. The armature core is built up of punched discs of soft sheet steel slotted around the periphery to receive the armature winding. These discs are re-annealed and insulated after being punched. The shape of the punching is such that when assembled on the steel shaft openings are provided for ventilation parallel to the shaft. Additional ventilation is secured by the use of radial air ducts.

The armature coils are all machine wound. Those for the smaller motors are of wire, while those for the larger sizes are composed of copper bars. The coils are all carefully insulated, then dipped into a bath of special insulating compound, and finally placed in a drying oven until they are thoroughly baked. Surface bands are used to retain the coils in the slots on the smaller sizes, while the same result is secured in larger sizes by the use of retaining wedges placed in specially provided notches near the top of each slot. The core and poles are constructed of soft laminated steel, giving the magnetic circuit which consists of these three elements, the highest permeability.

The commutator is built up of copper segments insulated from each other by sheets of mica, of hardness corresponding to that of the copper. The segments are of generous length and depth, insuring cool running, and allowing ample margin for wear. The commutator is easily removable from the armature shaft, tapped holes being provided in the face of the commutator sleeve for that purpose. As the commutator is usually the cause of more trouble than all other parts of a motor combined, unusual care has been given to its design and construction.

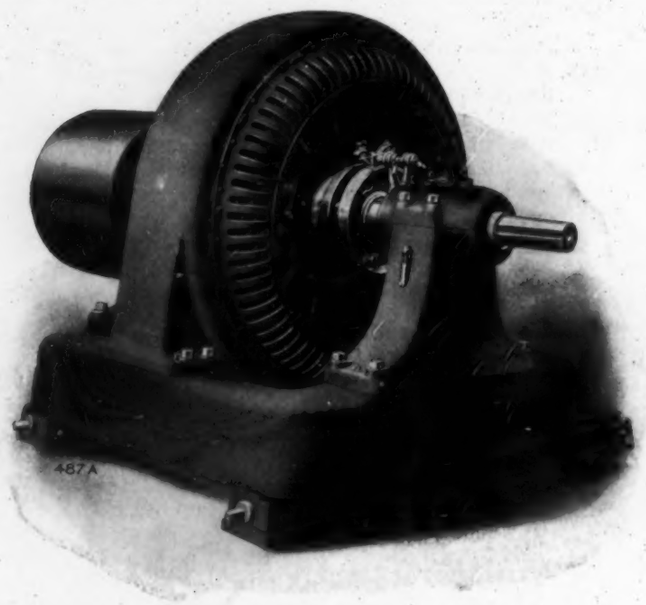


FIG. 1.—250 K. W. 3-PHASE "CECO" ALTERNATOR.

FIG. 2.—TYPE C. E. "CECO" MOTOR.

Carbon brushes are used, and the brush holders are of the Christensen company's coil spring reaction type. The brush holder studs to which the holders are secured are mounted upon a yoke, which is fastened to the inner side of the bearing bracket. Each brush can be readily adjusted and any brush can be quickly and easily removed while the motor is running. Wear of the commutator is provided for by radial adjustment of the brush-holder studs.

The motors are mounted on a cast iron sub-base, which is composed of a single casting, thus insuring perfect alignment. Belt tension is accomplished by moving the motor upon the sub-base in the usual manner. The ventilation of the armature and commutator is such that the motors will operate at their rated loads without the temperature of the armatures rising more than 30 degrees C. The rise in temperature of the field coils under these conditions will not exceed 40 degrees, and of the commutator 45 degrees C. These machines will operate from no load to full load with the brushes in a fixed position without sparking. They will also operate for two hours with 25 percent overload and for two or three minutes with 50 percent overload without injurious heating or sparking.

These motors will operate in any position in which the shaft is horizontal. This is accomplished by shifting the bearing brackets on the frame so that the oil chambers remain in the proper position, whether the motor is secured to the floor, the ceiling or the side wall.

The "Ceco" alternators, whether belted, engine type or direct couple, are of the revolving field type, leaving the armature stationary, and easily accessible. By this form of construction the difficulties of properly insulating the armature coils, which have caused much trouble in rotating armatures, are eliminated. The frame consists of cast iron housings, into which rings of laminated steel with inwardly projecting teeth are assembled, thereby forming slots for receiving the armature windings. The armature is designed with six slots per pole so that it may be wound or rewound for single, 2 or 3

FIG. 3.—TYPE C. E. ENCLOSED "CECO" MOTOR

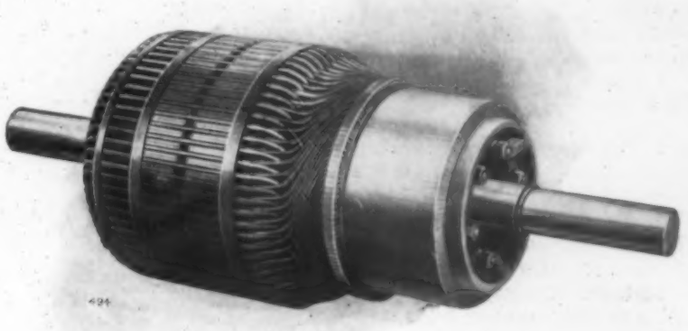


FIG. 4.—ARMATURE FOR "CECO" MOTOR.

phase as required. The armature frames for the belt driven alternators are cast in one piece, while the frames for the direct driven machines are divided horizontally. Instead of the usual practice of having several coils for the same machine, all the armature coils for each alternator are of the same size and shape so that they are interchangeable.

The poles are built up of laminated steel upon a cast iron spider, which is mounted upon a forged steel shaft. In the

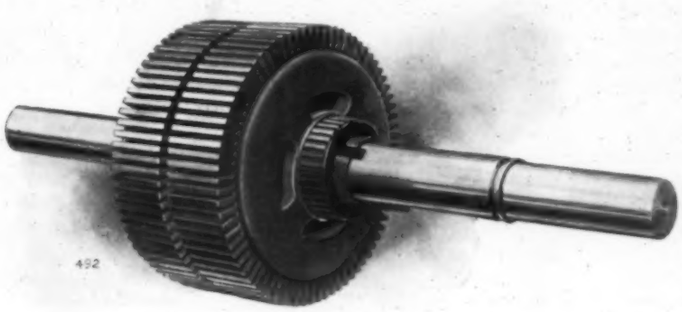


FIG. 5.—ARMATURE CORE FOR "CECO" MOTOR.

large sizes the laminated poles are assembled upon a steel ring which is carried on the shaft by means of the cast iron spider. The individual poles are in all cases removable with their coils, without dismantling the machine. The field coils are composed of rectangular copper strap bent on edge. The collector rings are made of cast iron, and carbon brushes are used, thus reducing to a minimum the tension required, as well as the wear of the parts. Standard frequencies are 60 and 25 cycles per second. With the exception of the smaller sizes "Ceco" alternators can be wound for any voltage up to 15,000. The temperature rise when running continuously with full load at any power factor will not exceed 35 degrees C. in the armature, or 40 degrees C. in the fields. At 25 percent current overload the corresponding temperatures will not exceed 40 degrees C. and 50 degrees C. The machines are all designed so that they will carry satisfactorily a 50 percent current overload for two hours at any power factor without injurious heating.

The Christensen Engineering Co.'s present works were completed two years ago, and include every facility for rapid, accurate and economical manufacture. The equipments of modern machine tools, cranes, special machines, etc., is unusually extensive. The foundation for a 250-foot extension to the main machine shop, which is 186 feet in width, has just been completed. There are three stories, and this extension will provide 88,000 additional square feet of floor space.

American Ship Building Co.'s Earnings.

At the annual meeting of the American Ship Building Co., held at Jersey City, N. J., last week, a 4 percent dividend was declared on the common stock, of which there is a total issue of $7,600,000. Seven percent has been paid annually on the preferred issue of $7,900,000 since the organization of the company three years ago, and it is more than probable that the common stock dividend will be permanent, as the financial statement shows the company to be absolutely free of debt with a surplus of $2,926,561.04. The statement shows net earnings of $2,507,551, an increase over the preceding year of more than $500,000. The total surplus for the year shows an expansion of $1,184,257.

The officers of the company were re-elected as follows: President, W. L. Brown, of Chicago; vice president, Robert L. Ireland; secretary and treasurer, Russell E. Wetmore; general manager, James C. Wallace, and general counsel, James H. Hoyt, all of Cleveland.

President W. L. Brown says in his annual report: "During the year the physical condition of each plant as far as possible, the expense incident to this having been charged to operating expenses. It has been found necessary to enlarge the foundry and pattern shops at Detroit, to erect some new buildings at West Superior, to make some alterations and repairs at Buffalo and to add some new tools and machinery at several of the plants; this work is now inprogress and to pay for it a special sum of $200,000 has been set apart, as shown in the treasurers report. Work done and under construction is as follows: Vessels built, 41; carrying capacity, net tons, 198,500; vessels under construction, 30; carrying capacity, net tons, 139,000.

"The construction during the year has comprised many kinds, ranging from the standard bulk and package freight carriers, for both lake and salt water traffic, to the most modern and highest type of passenger steamers, the various plants of the company demonstrating full ability to build and equip all classes and types of the highest class and best construction. The annual increase in lake traffic makes it fair to assume that there is likely to be continued construction and gradual replacement of out-of-date tonnage and hence a fair future business in this line of work for the company."

D. H. Rogers, of Alfred, N. Y., will probably remove his machine shop to Hornellsville, N. Y., as the citizens of the latter place have made flattering offers. As a bonus the buildings are to be donated.

KEYSTONE DRILLER CO.'S APPRENTICESHIP FORM.

Some account of the strike of the machinists at the works of the Keystone Driller Co., Beaver Falls, Pa., has appeared in *The Iron Trade Review*, the issues being well defined in a communication from R. M. Downie, the secretary of the company. The company proceeded to fill up its shop with strictly non-union men, accepting only such applicants as stated that they were non-union men and would enter into an agreement that while in the employ of the company they would not unite with any union. The plant is now running almost full and with comparatively little friction. The company is paying the same wages, or about the same, paid to machinists before the strike and is working 10 hours a day instead of the 9½ hours prior to the strike.

With a view to keeping the union out of its works the company has started at the bottom and is making non-affiliation with the union a condition in its apprenticeship contracts. Already a number of promising young men have been employed under this arrangement. As a matter of general interest we append a copy of the apprenticeship agreement:

APPRENTICESHIP CONTRACT.

Beaver Falls, Pa., ... 190..

....

residing at .....

desiring to engage with the *Keystone Driller Co.* as machinist's apprentice, represents and agrees as follows:

1. That the applicant is .... years of age and that he has advised his parents (or guardians) of his intention to enter this contract, and has obtained consent to do so as evidenced by his, her or their signature below.

2. That the applicant is not now a member of any labor organization that has for an object the "strike" or "boycott" as a means of settling difference between employee and employer; and he hereby obligates himself not to unite with any such association during the five years covered by this contract or during the further continuance of his employment with the Keystone Driller Co., and that he will not unite with any other person or persons in any strike against the said company; it being distinctly understood that joining any such association or uniting in any such strike shall of itself nullify and make void this contract and wholly release the said Keystone Driller Co. from the fulfillment of every obligation herein entered into with said applicant.

3. That he will faithfully perform to the best of his ability all reasonable duties assigned to him on day or night turn of ten hours; that he will obey courteously the instructions and directions of the foreman or his assistant, treat his fellow employes with respect, abstain from the use of profane or abusive language in or about the factory, that he will not absent himself from the factory unnecessarily or without, when possible, obtaining the foreman's permission. And, in general the applicant agrees to faithfully obey all the reasonable rules of the company and work for its interests.

In consideration of the foregoing representations and the performance of the above obligations, the Keystone Driller Co. agrees as follows:

1. That the term of this contract shall be for five calendar years, except that if after one month's trial the above named applicant shall be found to be not naturally adapted to the trade, the company may cancel this contract, giving notice to said applicant through the foreman.

2. The first three years of this contract shall be divided into six terms of six months each. For the first term the compensation to said apprentice shall be 8½ cents per hour; for the second term 10 cents per hour; for the third term 11½ cents per hour; for the fourth term 13 cents per hour; for the fifth term 14½ cents per hour; and for the sixth term 16 cents per hour.

At the end of said sixth term said apprentice shall receive a journeyman machinist's certificate, signed by the foreman, president and secretary of the company, certifying that the full apprenticeship has been completed. As a reward for good behavior, diligence and progress, the aforesaid six terms may each, at the discretion of the foreman or superintendent, be shortened one month, thus promoting the applicant to the next term at the increased pay. At the end of the sixth term the machinist's certificate shall be given and the holder then advance to 22½ cents per hour for one year and 23½ cents per hour for the remaining year and the time gained by promotion during apprenticeship. During this term the company agrees to furnish said applicant steady employment unless the works of said company are closed down for repairs or for other unavoidable causes. In case of continued sickness this contract shall be suspended until recovery.

3. During the said six terms of apprenticeship the company agrees to advance the said apprentice as fast as its work and his ability shall warrant, it being understood that for the first term the work will be anything directed by the foreman, but shall be mainly upon the machine floor, such as trimming castings, helping machinists place work in and out of lathes, running centering machine, pipe threader, bolt cutter, drill press, etc., in order to become familiar with the various machines and their uses. After this he shall be given such machines and advancement as his attainments and the company's work will warrant. During the six terms of apprenticeship he shall be entitled to receive from the foreman full instruction in the use of all tools, machines and appliances of the machine shop and in the best methods of doing the work.

4. The company shall not require said applicant to work on night turn in any case more than each alternate week and not at all unless it becomes necessary; that it shall not require the applicant to work on any legal holiday except by his own free consent, and that no work whatsoever shall be required on the Sabbath.

5. It is fully understood by the said applicant and his parent or guardian acting for him, that accidents are possible in the use of all machinery. It is the policy of the company to prevent all such, as far as it can. But it is strictly understood that the applicant assumes the risk of all such and that he is hereby required to use all possible precaution against the occurrence of accidents to himself, to others and to machinery placed in his charge; that he is hereby required to not do anything in or about the factory, no matter by whom directed, that will endanger life, health, limb or property, and he is strictly cautioned that the company does not hold itself responsible for the consequences of any violation of this requirement.

6. In case any disagreement about the terms of this agreement or any just cause of complaint arises which affects the said apprentice, appeal may be made to the superintendent, and if no agreement is reached the matter shall be reduced to writing and submitted to three arbitrators chosen in a way equally fair to both parties.

Gratuities.

1. After the trial months and during the remaining years of this contract the above apprentice shall be entitled to receive as a reward for good behavior at the company's expense any iron worker's, or machinist's, or trade journal which he may select.

2. On condition that the above six terms of apprenticeship and the two succeeding years above provided for are fulfilled, and the spirit of this contract is faithfully kept and fulfilled by the undersigned apprentice, the Keystone Driller Co. will, at the expiration of the fifth year, pay to him the sum of $100. This sum is no part of the consideration for services rendered, but is simply a mark of appreciation and good will.

3. If during the term of this contract the said applicant shall devise or discover any patentable improvement or thing pertaining to the company's business and of advantage to it, the company will upon the assignment of same to it procure such patent at its own expense and pay to the inventor for same upon allowance of the patent, the sum of at least $100. If not found patentable a committee of two, of which the company's superintendent shall be one, the other to be selected by the inventor, shall appraise the value of the improvement and the company shall pay for the same. But the sum awarded shall not exceed $50, except by the consent of the board of managers. The services of the company's draughtsmen are to be rendered free in making the drawings.

4. If the above apprentice during the continuance of this contract desires to take a course in mechanical drawing, that has been proposed by the Beaver Falls Y. M. C. A., the company will, upon request signed by the secretary of the said Y. M. C. A., pay the fee for same, and upon certification of

the completion of a one term course the company will present him with a case of drawing instruments.

In witness hereof and binding ourselves severally to the faithful performance of all the above stipulations and agreements, we hereto set our hands and seals to duplicate copies of this contract.

.....
.....
.....

I, the parent (or guardian) of the above named.....
....., have read the above contract carefully and now subscribe the same on his behalf and direct that ..... his wages, shall be paid to.....
.....

Witness:

.....
.....Seal.
.....Seal.
.....Seal.

The Columbus Malleable Iron Co., Columbus, O., whose building was destroyed by fire a year ago will begin melting iron Oct. 10, and will be in full operation by Oct. 15, the new building being just completed. The molding room is 60x212 feet; annealing and assorting room, 80x108 feet; core room, and pattern shop, 36x72 feet. The officers are: Chas. A. Klie, president and treasurer; H. T. Irvin, secretary and general manager. Several large orders have already been booked. The plant is equipped with an acid-lined open-hearth furnace, fully equipped with modern appliances.

The annual meeting of the Republic Iron & Steel Co. will be held Oct. 15 when a report covering its operation for the year will be given out. President Thompson says that the old directors and officials will be elected. "The company," said he, "is very busy. It is short on pig iron capacity and could use another furnace in the South."

The directors of the Ohio Tube Co., of Warren, O., last week declared the final dividend of 1½ percent, thus winding up the affairs of that company. Two years ago the plant was absorbed by the National Tube Co., but the original organization was continued until last week. During its period of independent existence the plant paid the stockholders dividends amounting to 117 percent.

The Browning Engineering Co., of Cleveland, O., has recently purchased from the Westinghouse Electric & Mfg. Co. a number of railway type crane motors, ranging in capacity from 25 to 50 horsepower.

The Hayden-Corbett Chain Co., of Columbus, O., which was organized a few months ago, is erecting a brick building 370x50 feet, which is now under roof. The company will be ready for operations about Oct. 15, and will have a capacity of 300 to 350 tons a month. The company's location gives it good shipping facilities. High grade hand and machine chains of every description will be manufactured.

The plant of the Budke Mfg. Co., Canonsburg, Pa., will shortly be removed to Parkersburg, W. Va., the Parkersburg Iron & Steel Co. having purchased the plant. The Budke plant will consume a large portion of the sheets manufactured in the Parkersburg sheet mill.

The Pittsburg & Lake Erie Railroad Co. has placed an order with the Carnegie Steel Co. for 15,000 tons of rails for delivery during 1903. Additional contracts were placed as follows: 1,000 steel cars of 50 tons capacity each, Standard Steel Car Co., Pittsburg; 30 consolidation freight engines, American Locomotive Co.; 5 Atlantic type passenger locomotives, American Locomotive Co.; 10 passenger coaches, American Car & Foundry Co.

The Frog Mountain Ore Co. is developing iron ore mines near Spring Garden, Ala.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of their Wants:—

Arthur L. Shipman and Edward A. DuBlois, of Hartford, Conn., and Leo J. Burdick, Los Angeles, Cal., have incorporated the Burdick & DuBlois Mfg. Co., for $50,000, to manufacture tools and devices for mechanical purposes. The dies, machinery and stock of Leo J. Burdick at Sturgis, Mich., have been transferred to the corporation.

The Taylor Water Tube Boiler Co., Detroit, will erect a three-story manufacturing building, 54x85 feet, at a cost of $8,000, exclusive of equipment.

Among the numerous improvements decided upon by the B. & O. R. R. Co. are machine shops, 165x60 feet, at Holloway, O., and Painesville, O.

The American Road Machine Co., of Kennett Square, Pa., will soon have plans started for an addition to its machine shop. It will be of brick and steel construction, one story high, and will cost $20,000. New equipment will be needed.

The St. Louis Southwestern Ry. will build repair shops at Luxara, Ark.

S. S. Pantchenko, an important official of the Russian Ministry of Ways and Communication, is now in the United States with a view to arranging for the placing of considerable contracts for equipment to be used for loading and unloading vessels. Mr. Pantchenko is at the Murray Hill Hotel, New York.

The National-Acme Mfg. Co., Cleveland, announces the opening of a western office at 2 and 4 Canal St., Chicago, with George D. Grant as manager. The company makes a specialty of the Acme Automatic multiple spindle screw machine and the Acme screw scotter, semi automatic.

The Malleable Iron Co., of Philadelphia, has purchased a paper mill plant at Spring City, Pa., and will equip it with the proper machinery for making malleable iron. It is expected that the plant will be ready for operation in about two months.

A charter has been granted to the Harmon S. Palmer Hollow Concrete Building Block Co., of Washington, D. C., with a capital stock of $2,000,000, the object of which is to make machinery for the manufacture of hollow concrete building blocks.

The Green Bay Combination Anvil & Tool Co., Green Bay, Wis., has been incorporated with a capital of $5,000, to manufacture the combination anvil and tool, which resembles the ordinary anvil and in addition has a drilling device and other tools.

The Structural Steel Supply Co., 44 West Twentieth St., New York, has been organized with a capital of $750,000. The purpose of this company is to supply in wholesale quantities and at wholesale prices structural steel and iron, of all standard sections and sizes, from its warehouses in New York and Boston.

The Cranes Nest Co., with an authorized capital of $10,000,000, has been chartered in Bristol, Va. The officers are George L. Carter, president; J. Norment Howell, vice president; T. F. Davis, secretary and treasurer. The general offices will be in Bristol and the company will own extensive coal and iron properties in southwest Virginia.

Wm. E. Ferguson, 334 East Twentieth St., Baltimore, Md., wants 60-horsepower engine and 80-horsepower boiler.

The West Virginia Boiler and Machine Works, Mannington, W. Va., want structural iron building 50x150 feet, corrugated steel sidings, corrugated iron roof, with trusses to carry five or ten-ton crane. Second hand will answer.

The Southern Co-operative Foundry Co., Rome, Ga., will need 63-inch cupola, four exhaust tumbling mills, two emery-wheel stands, nickel-plating outfit and supplies, and 125 squares of roofing tin.

Owen W. Davis, 68 Wall St., New York, wants furnace hoist, Crane preferred, for double cage.

The Birmingham Iron & Supply Co., Birmingham, Ala., will buy a shear to cut boiler plate rings into 12-inch square and one-half inch thick and less, with or without engine; hand shear for cutting corrugated iron, hoops, etc., all second hand.

The Indianapolis Switch & Frog Co., whose plant is located at Springfield, O., is preparing to move into a new plant, formerly used by the Whitely Malleable Iron Foundry. Growth of business has made necessary larger shops and additional equipment. When installed in its new location, the company will have over two acres of ground floor space under one roof with railroad tracks running directly into the shops.

The Marion Machine, Foundry & Supply Co. is a corporation with a paid in capital stock of $25,000. The officers are C. C. Chamberlin, president, and Henry L. Erlewine, secretary and treasurer. The company is now erecting a large machine shop and foundry plant in Marion, Ind., and will do a general machine and foundry business. It will deal in all kinds of new and second hand oil well supplies. The company asks all houses carrying supplies in its line to send their catalogs.

Marshall Felton, Melvin Barnes and A. A. Solenbeck have incorporated the Oklahoma Tool Manufacturing Co., Oklahoma City, Oklahoma, with capital stock of $50,000.

R. M. Shaffer, A. H. Callow, H. S. Roop and others have incorporated the Shaffer Boiler & Engine Mfg. Co., of Baltimore, with capital stock of $200,000, to manufacture boilers, engines, automobiles, steam launches, etc.; offices at 211 North Calvert St.

The Effingham Tank Co., Effingham, Ill., which is now making wooden tanks, expects to put in machinery for the manufacture of steel tanks, stand pipes and reservoirs.

The Texas Iron Co., with a capital of $600,000, has been incorporated under the laws of New Jersey. The names of the incorporators have not yet been given out.

The Baltimore Bridge Co., incorporated under the laws of the State of Delaware with a capital of $1,200,000, has obsorbed the Structural Iron & Steel Co., of Baltimore, Md., which has a capital of $200,000. The increased capital will be expended in additions to the plant and extensive improvements have been planned for the departments now in operation. A new girder shop to cost $75,000 is to be erected and the output is to be increased from 7,000 to 20,000 tons annually. Nathaniel Haven, of New York, is president and Alfred M. Mosscrop, of Rochester, N. Y., is vice president and general manager.

The Columbus Steel Rolling Shutter Co., of Columbus, O., has been organized for the purpose of operating a plant to manufacture steel rolling shutters. S. A. Webb, S. P. Elliott, J. W. Cartzdafner, C. C. Shepherd and Peter Ebner are the incorporators. The company is capitalized at $50,000.

The Textile-Finishing Machinery Co., of Boston, Mass., has been incorporated with $1.950,000 capital, of which $950,000 is preferred and $1,000,000 common. The new company is a consolidation of the Granger Foundry & Machine Co., the Phœnix Iron Foundry and the Thomas Phillips Co., of Providence, R. I., and the Rusden Machine Co., of Warren, Mass. At a meeting of the incorporators the following named directors were elected: H. Martin Brown, Frederick C. Sayles, Jr., E. A. Rusden, Henry A. Tillinghast, Frederick I. Dana, James Tillinghast, William A. Walton, Harold J. Gross, George C. Phillips, George L. Gross, William S. Granger. The directors elected as officers: President, H. Martin Brown; vice president, Frederick C. Sayles, Jr.; general manager, E. A. Rusden; general sales agent, Frederick I. Dana, and Mr. Tillinghast as secretary and treasurer. The business of the company will be conducted by an executive committee, consisting of Messrs. H. A. Tillinghast, Rusden and Dana.

C. O. Jeliff & Co., manufacturers of wire goods of Southport, Conn., have purchased the wire weaving plant of P. O. Dwyer at Danbury, Conn.

The Illinois Brass Foundry Co., of Chicago, has been incorporated with $10,000 capital for the purpose of conducting a brass foundry. G. F. B. Miller, A. F. Hammann and August C. Waschow are the incorporators.

The Wichita Bridge Co. and the Oklahoma Bridge & Structural Iron Co., of Wichita, Kan., have consolidated and have been reincorporated under the firm name of the Southwestern Bridge & Iron Co. with $100,000 capital.

Casey & Thompson Co., of Chicago, has been incorported with $2,500 capital for the purpose of dealing in iron and steel products. W. C. Foley and A. Levine are the incorporators.

The Albuquerque Foundry & Machine Co., of Albuquerque, N. M., has been incorporated with $50,000 capital for the purpose of operating a foundry and machine shop. R. P. Hall, R. M. Hall and Jahn Munn are the incorporators.

J. M. Beavo and N. J. Coppock, of Jonesville, Ind., are in Los Angeles, Cal., endeavoring to promote a company to operate a tin plate plant on the Pacific coast.

The Wayne Iron Co., Ltd., of Detroit, Mich., with a capital of $300,000, has been organized for the purpose of operating the Peninsula and Detroit blast furnaces at Detroit. The stock is held as follows: J. H. Berry, $111,000; W. G. Sharpe, $60,000; Solon Burt, $8,000; W. G. Smith, $15,000; Lee Burt, $5,000, and John Christian, $1,000. The output of the furnaces will consist of charcoal iron.

Fires and Accidents:—

The gray iron foundry of Beaupre & Son, Montreal, Can., was recently damaged by fire to the extent of $2,000.

The plant of the American Lock Washer Co., Newark, N. J., was completely destroyed by fire last week entailing a loss of $50,000.

New Construction:

The Fuller Mfg. Co., East Moline, Ill., will shortly have plans prepared for the erection of a foundry for the manufacture of all the castings required in its plant.

The Anderson Foundry & Machine Co., Anderson, Ind., manufacturer of rolling mill machinery, has decided to practically double the output of its present plant. The machine shop is to be enlarged by the erection of an addition 200x35 feet while the boiler shops will be entirely rebuilt. The present erecting shop is to be replaced by a more substantial structure. A large amount of new machinery will be required in equipping the addition to the machine shop.

The Chattanooga Machinery Co., Chattanooga, Tenn., has purchased a site and will erect foundry and machine shops; foundry building to be of stone and brick, 60x120 feet, to cost $7,000; machine shop of brick and stone, 100x150 feet, to cost $13,000; pattern shop of brick, 50x50 feet, and storage building 50x50 feet.

The Standard Foundry Co., of Cleveland, which recently purchased the sadiron manufacturing building at Chagrin Falls, O., has bought eleven acres at Chagrin Falls in order to enlarge the works and build dwelling houses for workmen. A foundry, 136x400 feet, will be built, and also a finishing department. Registers and steel ranges will be made at the Chagrin Falls plant.

The Portland Iron & Steel Co., of Portland, Me., whose rolling mills at Ligonia, near Portland, were destroyed by fire a few weeks ago, is about to rebuild its plant. It will be much larger than before and the buildings will be of steel, and arranged so as to enable the company to do a much larger business than ever before. It is said that the new buildings outside of the machinery will cost $100,000. New York and Western capital is interested in this company.

Work on the erection of the new plant of the Fort Wayne Steel Foundry Co., Fort Wayne, Ind., will be begun shortly. The main foundry building will be 60x480 feet and will be of steel. The cost will be about $150,000 and operations will be commenced no later than April next year.

The Norfolk & Western Railroad has decided to build a shop at Roanoke, Va., for the building of locomotives. The cost is estimated at $250,000.

A. J. Brawley and Robert Wellesch will erect a gray iron foundry at Celwein, Ia. The main building will be 70x100 feet.

The Saxton Furnace Co., of Philadelphia, Pa., whose blast furnaces are located at Saxton, Pa., is contemplating the erection of two open-hearth furnaces.

The D. M. Sechler Carriage Co., Moline, Ill., is preparing plans for the erection of a foundry for the manufacture of all the small castings required in the construction of its wagons.

B. Rockhill, of Lynchburg, Va., has purchased a site and will build a machine shop.

The Union Furnace Manufacturing Co., Union Furnace, Pa., is preparing to rebuild its shovel plant which was recently destroyed by fire.

The American Car & Foundry Co. will erect a large paint shop at the Detroit plant at a cost of $28,000. The building

which will be of brick, will be 370 feet in length, 83 feet wide and 22 feet high. The roof will be of composition of the zigzag design, supported by trusses.

The A. Y. McDonald & Morrison Co., Dubuque, Ia., will erect a warehouse 259x101 feet near its foundry. Work will be begun this fall.

George Thrall, Detroit, will erect a boiler shop 85x54 feet, three stories.

Engineers are running lines on the property of the Valley Iron Co., in DeKalb County, Alabama, for the purpose of locating a site for the company's projected blast furnace. The work of construction will be commenced before the end of the year. James Bowron, chairman of the board of directors, says that about a year and a half will be required in building the furnace. Charles E. Bowron, who has been elected general superintendent, entered upon his duties Oct. 1. He has been chief engineer of the Alabama Consolidated Coal & Iron Co.

The court at Mt. Vernon, O., has authorized an issue of $30,000 in certificates to complete the Coxey steel plant in that city, recently placed in the hands of a receiver. The money will be used in the completion of the building and the paying for material and machinery already purchased, and is not to be used in paying any of the labor claims. It is understood that this amount will put the plant in good running order.

Kohlman & Christison, St. Paul, Minn., will erect a two-story frame machine shop, the roof to be of iron.

The construction of the plant which the American Tube & Stamping Co. is building at Bridgeport, Conn., has been delayed by the inability of rolling mills promptly to deliver angles and channels, but the company hopes to have the buildings completed by Dec. 1 and to have the plant equipped and ready for operation early in 1903. The machinery will include engines capable of developing 7,000 horsepower for the blooming mill.

A contract for the erection of the superstructure of an immense power house at the east end of the 10th avenue S bridge, Milwaukee, has been awarded by the Twin City Rapid Transit Co. When completed and the machinery installed the total cost will be nearly $1,000,000.

Work is progressing rapidly on the plant of the St. Louis Car Wheel Co. at Atlanta, Ga. It is expected that the plant will be in operation by Nov. 1, turning out 200 car wheels per day.

The plant of the Knoxville Iron Co. at Harriman, Tenn., has been dismantled and the machinery moved to the new plant which has been erected at Knoxville. It is expected that a start will be made by Nov. 1.

The Supervising Architect, Washington, D. C., will open bids on Nov. 10 for the erection of the U. S. Government buildings at the Louisiana Purchase Exposition, St. Louis.

The Pittsburg District:—

On Friday, September 26, C. V. Slocum, president of the Keystone Car Wheel Co., of Pittsburg, entertained the members of the Pittsburg Railway Club at the company's plant at West Homestead, Pa. The party was conducted through the entire foundry after which lunch was served.

The Sligo Iron & Steel Co., of Pittsburg, has been incorporated with a nominal capitalization of $1,000, which will be increased shortly. The company will erect a new bar iron plant in the vicinity of Mingo Junction, O.

The Harbison-Walker Refractories Co., of Pittsburg, has declared a quarterly dividend of 1½ percent on its preferred stock payable on October 20. Next month the stockholders of the company will vote to increase the total issue of stock to $27,600,000.

Sylvester A. Cosgrave, of Pittsburg, sailed last week for France and Russia upon the invitation of prominent steel manufacturers of those countries to experiment in their works in the manufacture of compound steel ingots. The process was tried at the local plant of the Carbon Steel Co., but the plates thus made did not pass a successful test by the government.

The Standard Engineering Co., of Pittsburg, has been organized with $300,000 capital for the purpose of erecting and operating a plant for the manufacture of engines and mechanical equipment at Ellwood City, Pa. The officers of the company have not yet been announced but it is stated that some of the officials of some of the constituent companies of the United States Steel Corporation are interested in the project.

The Union Steel Casting Co., Pittsburg, last week declared its usual quarterly dividend of 3 percent. Officers were re-elected as follows: C. C. Smith, president; S. H. Church, vice president; G. W. Smith, secretary, and G. W. Eisenbeis, treasurer.

General Industrial Notes:—

The Canonsburg Steel & Iron Works, Canonsburg, Pa., has purchased the rolling mill at Canonsburg, Pa., formerly owned and operated by the American Tin Plate Co. The plant is now being improved and repaired and operations will be resumed under the new ownership shortly after the first of the year. The new company proposes to manufacture steel and iron sheets for deep drawing, stamping, enameling, tinning, galvanizing, japanning, etc. John F. Budke is president and general manager. The other officials are John M. Watson, vice president; William H. Paxton, treasurer, and G. W. Retberg, secretary. The company is incorporated with $250,000 capital.

The Newport News Shipbuilding Co., Newport News, Va., has been awarded the contract for the construction of the battleship Louisiana at its bid of $3,990,000. This ship will be constructed in competition with the sister ship the Connecticut, which will be built at the New York Navy Yard for the purpose of seeing which yard can turn out a ship in the shortest time.

The Fort Wayne Steel Foundry Co., Fort Wayne, Ind., recently incorporated, has purchased the buildings of the plant of the National Steel Casting Co., at Montpelier, Ind., and will remove them to Fort Wayne at an early date.

At the annual meeting of the Duncannon Iron Co. New Bloomfield, Pa., held last week, officers were elected as follows: Wm. Wister, president; J. E. Jackson, treasurer; George Pennell, manager, and J. B. Laquear, secretary. The death of Mr. Laquear was announced shortly after the meeting was adjourned.

The car wheel foundry of the St. Louis Car Wheel Co., of St. Louis, Mo., under erection at Atlanta, Ga., is fast nearing completion. Within a month the first cast will be made. The foundry is designed for the manufacture of 200 wheels daily and it is probable that a brass foundry will be added in the near future.

The molders employed in foundries located in Western New York have been granted an advance of 15 cents a day for the year ending Sept. 1, 1903. The minimum has been advanced to $2.80 per day.

One of the furnaces of the Columbus Iron & Steel Co., Columbus, O., which was blown out some time ago on account of the shortage of coke, has been relighted. The company has a sufficient supply of coke on hand at present to avoid the necessity of banking in the future.

Work on the new plant of the Norwalk Steel & Iron Co., Norwalk, O., is not progressing very rapidly at present owing to the inability of the contractors to secure material. The structural work on the main building has just been completed and the installing of cranes has just begun. The plant cannot be placed in operation before the first of the year.

The Londonberry Iron Co.'s blast furnaces, iron and coal mines and other property at Acadia Iron Mines, near Londonberry, Nova Scotia, have been purchased by a syndicate composed of Geo. E. Drummond, Thos. J. Drummond, James T. McCall, Lieut.-Col. Fred. Henshaw and Edgar McDougall, of Montreal, and Chas. W. Brega, of Chicago. Geo. E. Drummond is managing director, and Thos. J. Drummond secretary of the Canada Iron Furnace Co., Ltd., which has a furnace at Radnor Forges, Que. The Londonberry furnaces have been idle since 1896. The foundry plant of the company has been under lease by Drummond, McCall & Co., for the manufacture of water pipe and castings. The purchasers of the furnaces and mines have decided to expend $100,000 to put the properties in shape for early operation.

The National Machinery Co., of Tiffin, O., states that trade in the past 30 days has been highly satisfactory. Orders of considerable size have been steadily coming in, and in order to be able to live up to promised deliveries the company lately

doubled its capacity by the addition of new machinery and is in much better shape than ever to get out orders quickly. From the inquiries and orders that are received from every quarter the company regards the outlook for the winter and spring very promising, and is confident it will have all the business it can handle.

The hot mills of the Elwood, Ind., plant of the American Tin Plate Co., resumed operations several days ago. The bar mill has not yet been placed in operation, however, and unless the latter is soon placed in operation the prospects for a steady run are not bright.

The Cincinnati Planer Co. continues to make extensive improvements to its plant and equipment. It is now installing a 150-h. p. boiler, 50-k. w. generator and a 25-h. p. motor, 14 and 18-inch Lodge & Shipley lathes, 36-inch Schumacher & Boye lathe, 48-inch G. & E. automatic gear cutter, 16-foot Bridgeport automatic screw lathe, No. 3 Owen miller, 3-foot and 5-foot Fosdick radials, Higley cold saw and several of its own planers. The company reports a steady run of orders and predicts a prosperous year for 1903.

The Standard Motive Power Co., of Canal Dover, O., has awarded contracts for the erection of its boiler shop. The main building will be 500 feet long and 200 feet wide. The company will shortly award contracts for the machinery and equipment of the plant.

The Amalgamated Association of Iron, Steel and Tin Plate Workers has declared a strike at the plant of the Tuscora Steel Co., Newcomerstown, O., which has recently been taken over by the Sheet Steel Co., of Pittsburg. When the new company secured the plant the men were asked to work on a non-union basis, but this they refused to do and a strike was declared.

Numerous rumors have been current that certain plants are to be dismantled by the newly organized American Fork & Hoe Co., of Cleveland. One of the plants thus marked for obliteration was that of the Brown-Hinman-Huntington Co., of Columbus, O. We are advised that the American Fork & Hoe Co. does not own the property of the Columbus company and that the only plants which have been or will be dismantled by the new consolidation are two small concerns, one in Maine and the other the plant of Smith, Hopper & Sons, Philadelphia.

The new plant of the Tway Steel Forge & Machine Co., Centreville, N. J., is fast nearing completion. The plant will be equipped with two 25-foot heating furnaces and two hammers of 3,000 and 5,000 pounds capacity, respectively.

The entire plant of the Elmira Rolling Mill Co., Elmira Heights, N. Y., is now in operation and high grade refined merchant bar iron is now being produced. The puddling department has been in operation for several weeks. E. E. Buchanan is president; I. D. Booth, vice president; N. D. Doxey, treasurer and general manager, and Jesse L. Cooley, secretary.

The recent fire in the plant of the Havana Metal Wheel Co., Havana, Ill., did not delay the operation of the wheel works and only three heats were lost in the foundry. There was no machinery in the new building which was destroyed except engine and line shafting.

The directors of the Tennessee Coal, Iron & Railroad Co. have ratified the sale of the furnace property at Sheffield, Ala., and of the Russellville ore mines of the Sheffield Coal, Iron & Steel Co. to the syndicate which will probably be known as the Sheffield Coal & Iron Co. This company is the result of the formation of the United States Iron Co. The company has already issued common stock amounting to $2,500,000, all of which has already been taken. The company has also purchased the property of the Stone Gap Colliery Co., in the Stonega district, Va., and will immediately erect 30 coke ovens.

A portion of the mills that are being rebuilt by the Eastern Steel Co., at Pottsville, Pa., will be placed in operation within a few weeks. The 12-inch merchant mill will be placed in operation first and will be followed by the 19-inch mill.

The bell weld tube mill of the Youngstown Iron, Sheet & Tube Co., Youngstown, O., was placed in operation last week, being the last of the mills in the tube department of this extensive plant to be placed in operation.

The Marion Machine & Tool Co. has completed the dismantling of its plant at Marion, Ind., and shipped its machinery to Upper Sandusky, O., where the company will have a larger and better plant.

The Illinois Car & Equipment Co., of Hagewisch, Ill., just outside of Chicago, has recently purchased a large amount of electrical apparatus which will be used for the operation of wood turning machinery. An order on the Westinghouse Electric & Mfg. Co. includes two 250-K. W. and one 200-K. W. two-phase alternators, together with a four-panel switchboard and two 100-H. P., five 75-H. P., and one 50-H. P. induction motors.

The Spartanburg Electrical & Machinery Co., Spartanburg, S. C., recently incorporated, will do a wholesale and commission business in electrical supplies, machinery, etc., and will make a specialty of installing electrical plants. The company will not build at present.

The Cleveland Crane & Car Co. reports recent sales as follows: One 15-ton electric traveler with 5-ton auxiliary hoist, to Kenney & Co., Scottdale, Pa.; one 5-ton electric traveler to the Bettendorf Axle Co., Davenport, Ind.; one 20-ton, one 15-ton and two 5-ton electric travelers to the Titusville Iron Co., Titusville, Pa.; one 3-ton electric hoist crane to Heine Safety Boiler Co., Phœnixville, Pa.; one 35-ton hand power traveler to East St. Louis & Suburban Railway Co.; one 10-ton electric traveler to Erie City Iron Works, Erie, Pa.; one 6-ton hand power traveler to Chillicothe Electric Railway Co., Chillicothe, O.; one 10-ton jib to National Tube Co., McKeesport, Pa.; one 2½-ton hoist to Star Drilling Machine Co., Akron, O.; one 3-ton hand power traveler, Craig Shipbuilding Co., Toledo, O.; one 5-ton hand power traveler to Fred'k A. Verdon, Hoboken, N. J.; one 10-ton electric hoist and traveler to Oakland Iron Works Co., Oakland, Cal.; one 5 and one 10-ton electric traveler to West Virginia Bridge & Construction Co., Glens Run, Va.; one 2-ton traveler to Novelty Iron Co., Canton, O.; one 50-ton hand power traveler to Union Electric Light & Power Co., St. Louis; one 8 and one 6-ton hand power traveler to J. J. Roger Locomotive Works, Au Sable Fork, N. Y.; one 2½-ton electric hoist to Brown & Sharpe Mfg. Co., Providence, R. I.; one 5-ton, 3-motor gantry crane to Wm. B. Pollock Co., Youngstown, O.; one 3-ton hand power traveler to Columbia Foundry & Machine Co., South Norwalk, Conn.; one 10-ton hand power traveler to Variety Iron Works, Cleveland; one 10-ton hand power traveler to Kalamazoo Paper Co., Kalamazoo, Mich.; one 8 and one 6-ton hand power traveler to Munising Paper Co., Munising, Mich.; one 10-ton electric traveler to Susquehanna Iron & Steel Co.; two 15-ton electric travelers to Scaife Foundry & Machine Co., Pittsburg; one 5-ton electric and one 5-ton hand power traveler to Franklin Rolling Mill Co., also one 25-ton traveler with 5-ton auxiliary hoist, Franklin, Pa; one 4-ton hand power traveler to L. O. Koven & Bro., Hoboken, N. J.; sixteen 20-ton and two 10-ton hand power travelers to John B. McDonald, New York Rapid Transit Co., New York City; one 2-ton, 9-motor special traveler to American Car & Foundry Co., Madison, Wis.

Judge O'Gorman, of the Supreme Court of New York, has appointed Jeremiah J. Richardson temporary receiver of the Richardson & Morgan Co., manufacturer of furnaces and ranges, at 92 Beekman St. Suit was brought for the voluntary dissolution of the corporation. It was organized in June, 1895, with a capital stock of $100,000. The company's foundry was formerly at South Norwalk, Conn. The liabilities are $26,882 and nominal assets $34,879.

The Southwark Foundry & Machine Co., of Philadelphia, Pa., will shortly make shipment of some large engines, which are intended to be installed in British blast furnace plants now being remodeled on American lines.

Logeman Bros., machinists and boiler makers in Milwaukee, Wis., have leased the building until recently occupied by the Nordberg Mfg. Co., and will move into it shortly. The new location will afford ample accommodations for a growing business. The Nordberg Co. has moved into its new plant.

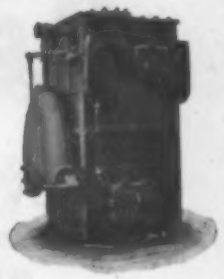
A recent circular of the Nova Scotia Steel & Coal Co., referring to the $1,850,000 needed to enlarge various plants, announces that to raise these funds the $1,910,000 of common stock now in the treasury will be sold.

How Much Is Your Coal Bill?

THIS always important question becomes vital when a coal strike raises prices. If we could show you how to cut down your coal bills 5 or 10 per cent—or 15 per cent—or 25 per cent—would you listen to the proposition?

If you have steam exhausting free to the atmosphere, or if you run all-condensing, with everything belted to the main shaft, or if your auxiliaries are motor-driven, a Cochrane Feed-Water Heater will cut down your coal bills 5 to 25 per cent, according to the conditions, by enabling you to do *all* your work *with that much less coal.*

The proposition is a plain one that any man can understand, and the results given are to the entire satisfaction of hundreds of concerns. We will put the details of it in black and white as soon as you give us the particulars of your requirements and tell us where to address you. Send for Catalogue 11-H.



HARRISON SAFETY BOILER WORKS

Clearfield and 17th Sts. PHILADELPHIA, PA.

STILWELL'S FEED WATER HEATER

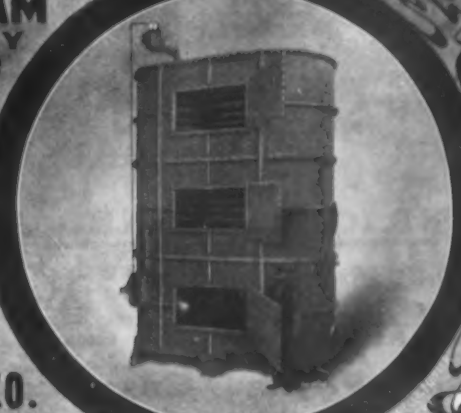
USES EXHAUST STEAM TO HEAT AND PURIFY THE WATER FOR YOUR BOILER.

ITS USE INSURES CLEAN BOILERS, GREATER EFFICIENCY AND SMALLER FUEL BILLS.

IF INTERESTED, WRITE

THE STILWELL-BIERCE AND SMITH-VAILE CO.

M.O.B. 227. DAYTON, OHIO.



TIN PLATES

Coke Charcoal Roofing

Galvanized and Black Sheets

The J M & L A OSBORN CO. CLEVELAND COLUMBUS

SHEET METAL STAMPING

DIFFICULT WORK A SPECIALTY

LARGE FACTORY FACILITIES

FEDERAL MANUFACTURING CO.

SMITH STAMPINGS FACTORY

MILWAUKEE, WIS.

COLD ROLLED STRIP STEEL

ALL WIDTHS, GAUGES AND TEMPERS

IN COILS OR CUT TO LENGTHS

FEDERAL MANUFACTURING CO.

SHEET STEEL MILL

SOUTH CHICAGO, ILL.

KOKOMO STEEL AND WIRE CO.

MANUFACTURERS OF

Wire Nails, Plain and Galvanized Wire

ALL STANDARD BRANDS

GALVANIZED AND PAINTED BARB WIRE

INCLUDING OUR SPECIAL BRANDS OF

BARB WIRE, HERCULES AND MARKET WIRE.

WIRE STRAIGHTENED AND CUT TO LENGTHS.

OFFICE AND MILLS LOCATED AT
KOKOMO, INDIANA, U. S. A.

The Cuyahoga Wire & Fence Co.,

CUYAHOGA FALLS, OHIO,

MANUFACTURERS OF

WIRE RODS.

Annealed and Galvanized Fence Wire, and Hartman Wire Fencing.

BRIGHT, TINNED AND COPPERED MARKET WIRE.

Tinned Mattress and Broom Wire.
Annealed Stone Wire.

Wire Straightened and Cut to Lengths. **WIRE NAILS.**

Works:—Cuyahoga Falls, Ohio. Newcastle, Penn.

WIRE DRAWING AND CHAIN MAKING MACHINERY.

Our line is complete and up to-date. Twenty-five years' experience has given us an intimate knowledge of what is needed and enabled us to build machinery whose records have never been equaled, not only in the past but at the present time. Why not investigate the matter and equip with money-making machinery? We want your order, either large or small.

THE TURNER, VAUGHN & TAYLOR CO., Cuyahoga Falls, Ohio.

The Lorain Steel Company,

LORAIN, OHIO.

Rails, Blooms, Billets and Slabs.

American Steel & Wire Co.

CHICAGO NEW YORK WORCESTER DENVER SAN FRANCISCO

SPRINGS

WIRE OF EVERY DESCRIPTION—round, flat, square, triangular and odd-shaped. Music wire. Mattress, broom, weaving and market wires in all finishes. Special wires adapted to all purposes.

WIRE HOOPS for use on lime barrels, sugar, salt, produce, apple, cracker, cement and flour barrels and other slack cooperage.

ELECTRIC WIRES AND CABLES of all kinds, bare and insulated. Iron, aluminum and copper. Telegraph and telephone wire. Pole steps.

RAIL BONDS for electric railroads.

WIRE ROPE, heavy cables and hawsers. Elevator, tramway, dredging and derrick ropes, ships' rigging, extra flexible ropes, sash cord and clothes lines.

BALE TIES for baling hay, straw, flax and all kinds of fibrous materials; also for bundling lumber, mouldings, staves and heading.

BARBED WIRE, both two and four point; Glidden, Baker, Perfect, Ellwood Waukegan, Lyman and Iowa brands.

NAILS, STAPLES, SPIKES AND TACKS of all kinds. Standard wire nails in all sizes and shapes. Miscellaneous fine nails. Tacks in count and weight packages. Dowel pins. R. R. spikes.

WOVEN WIRE FENCING.

COPPERAS for chemicals, disinfectant, purification of gas, polishing, for wood preservative and for fertilizing.

VENETIAN RED AND OXIDES OF IRON for making bridge paint, car, roof and all outside paints, and for dyeing.

POULTRY NETTING galvanized before weaving. All meshes and sizes.

WIRE RODS of open hearth and Bessemer steel.

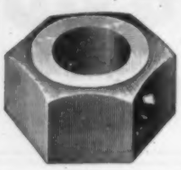
HORSE SHOES "Juniata" brand, iron or steel in all sizes and patterns. Also toe calks.

SHAFTING, COLD DRAWN STEEL free cutting screw steel. Roller bearing rods, rounds, squares, hexagons, flats and special shapes.

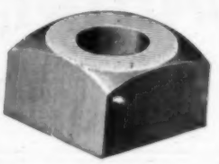
PLATES AND SHEETS of open hearth and Bessemer steel.

The Milton Manufacturing Co.,

MILTON, PA.



Manufacturers of **COLD PUNCHED NUTS**



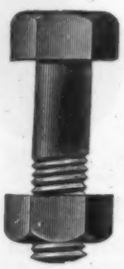
HOT PRESSED NUTS, PLATE WASHERS, ETC.

Quality and Finish the Best. Send Specifications for Prices.

American Iron & Steel Mfg. Co.

General Offices at Lebanon, Pa., U. S. A.

MANUFACTURERS OF



Merchant Bar Iron and Steel

(Annual Capacity about 150,000 Tons)

Also Every Variety of

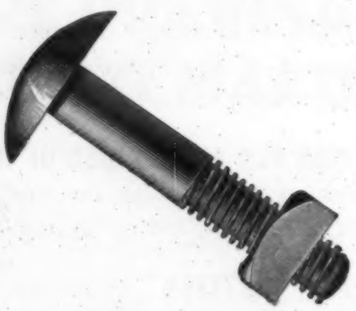
Machine Bolts, Nuts, Washers, Turnbuckles, Lag Screws, Railway and Dock Spikes, Harvey Grip and other Railway Track Bolts.

BOILER, SHIP AND STRUCTURAL RIVETS.

Car Forgings and Rods and Irons for Bridges, Buildings, Etc., Etc.

This Company owns and operates the works formerly owned by

J. H. STERNBERGH & SON, Reading, Pa. NATIONAL BOLT, NUT AND RIVET WORKS, Reading, Pa.
LEBANON IRON CO., Lebanon, Pa. EAST LEBANON IRON CO., Lebanon, Pa. PENNSYLVANIA BOLT AND NUT CO., Lebanon, Pa.



SPRING BOLTS.

Ear Bolts with Square or Oval Nuts.
Center Bolts and Shackle Bolts.
Write for Samples and Prices.

The UPSON NUT CO.

CLEVELAND.

When writing, refer to this advertisement.

REPUBLIC IRON & STEEL CO., CHICAGO, ILL.

BAR IRON BAR STEEL

Machine Bolts, Carriage Bolts, Gimlet Point Coach Screws, Turnbuckles.

NUTS. R. R. SPIKES. PIG IRON.

NEW YORK, CLEVELAND, BIRMINGHAM, PITTSBURG, BUFFALO, CINCINNATI, ST. PAUL, SAN FRANCISCO, ST. LOUIS, JOPLIN, MO., PORTLAND, ORE.

American Sheet Steel Company

Battery Park Building New York

Manufacturers of all varieties of

IRON AND STEEL SHEETS

Black and Galvanized
Plain and Painted
Flat, Corrugated and "V" Crimped

Apollo Best Bloom Galvanized Sheets
W. Dewees Wood Company's Planished **Iron**
W. Dewees Wood Company's Refined **Iron**
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S. J. Waterman, Union Trust Bldg., Cincinnati
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Wm. B. Isaacs, 226 Market Street, San Francisco
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T. W. Simpers, Land Title Building, Philadelphia
F. C. Milliken, Vandergrift Building, Pittsburg
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DISTRICT SALES OFFICE: MARQUETTE BUILDING, CHICAGO

SEND US YOUR ORDERS FOR

CRUCIBLE STEEL CASTINGS

WE BEGIN CASTING THE DAY FOLLOWING RECEIPT OF PATTERNS.

Nortmann-Duffke Foundry Co.
26th Avenue, Layton Park, Milwaukee, Wis.

TINDEL-MORRIS COMPANY, EDDYSTONE, PA.
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STEEL FORGINGS
Railroad, Marine and Machine. All Shapes. Heavy Shafting in the rough, rough turned or finished.

TRADE SABLE MARK.

Steel and Iron Sheets

Best in the market for STAMPING and ELECTRIC WORK. BLACK and GALVANIZED. PLAIN and PAINTED. FLAT and CORRUGATED.

Specialty: Sable Brand Best Forging Iron. Zug & Co., Ltd., Pittsburg, Pa.

"MUSKINGUM"

IRON AND STEEL SHEETS.

BLACK, PLAIN and PAINTED. FLAT, CORRUGATED and "V" CRIMPED.
REFINED IRON SHEETS, ELECTRICAL SHEETS.

Goff, Horner & Co., Limited,
Rooms 1111, 1112 and 1113, Frick Bldg., PITTSBURG, PA. WORKS: Zanesville, Ohio.

HIGH CARBON SHEETS

CRUCIBLE AND OPEN HEARTH.

Our Sheet Department is now ready for operation. We would be pleased to have your inquiries.

SHOVEL STEEL.

Colonial Steel Co., Pittsburgh.

Old Style Tin
M F Roofing Tin is the original old-style roofing tin—made entirely by hand labor from perfect black plates, the surface of which is covered and thoroughly amalgamated in the old style M F process with a heavy coating of pure tin and new lead.
MF Roofing Tin
has been used since the early part of the Nineteenth Century in Great Britain and America, and covers a great number of important buildings in this great territory, where it has lasted more than 50 years. Specify M F Roofing tin in your building estimates.
MF TERNE 14/20 IC
or Write to W.C.CRONEMEYER Agt. CARNEGIE BUILDING PITTSBURG, PA
For Free Book on Roofing.
AMERICAN TIN PLATE COMPANY, NEW YORK.

DOES IT PAY to use coated sheets in place of black?

IT DOES if you use the ALUMINUM COATED.

Some of our customers are using it as a substitute for copper.
It can be soldered with common solder.

The Steel & Iron Aluminum Coating Co., CONNELLSVILLE, PENN'A.

American Steel Hoop Company

GENERAL SALES OFFICES: CARNEGIE BUILDING, PITTSBURGH, PA.

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CHICAGO: The Rookery CINCINNATI: Union Trust Building CLEVELAND: Perry-Payne Building
DENVER: People's Bank Building DETROIT: Union Trust Building NEW YORK: Empire Building
PHILADELPHIA: Harrison Building SAN FRANCISCO: 258 Market Street
ST. LOUIS: Chemical Building ST. PAUL: Pioneer Press Building WASHINGTON: National Safe Deposit Building

FOREIGN SALES OFFICES:

CITY OF MEXICO, 924 Apartado. MONTREAL, CANADA: Bell Telephone Building

National Tube Company,

Manufacturers of

BLACK and GALVANIZED
Wrought Merchant Pipe, all kinds: sizes 1-8-inch to 30-inch, fitted in any manner desired.

BOILER TUBES,
Mild Steel and Charcoal Iron, for Stationary, Locomotive and Marine Work.

CASING, TUBING
and Drive Pipe for Well Purposes.

GAS AND OIL LINE PIPE.

CYLINDERS,
Lap-Welded and Seamless, tested from 100 to 3,700 lbs., for Compressed Air, Carbonic Acid Gas, Anhydrous Ammonia, etc., etc., etc.

WATER and GAS MAINS,
Converse and Matheson Lead Joint Pipe, 2-inch to 80-inch.

SEAMLESS
Tubes, Shrapnel, Projectiles and Miscellaneous Forgings.

GENERAL OFFICES:
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LOCAL SALES OFFICES:
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267 South 4th Street, Philadelphia. 420 California Street, San Francisco, Cal.

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OTIS STEEL

"OTIS" FIRE BOX PLATES A SPECIALTY.
Flange Plates, Ship Plates, Tank Plates, Steel Car Axles and Forgings of all kinds.

Steel Castings from 100 to 75,000 lbs.

Head Office and Works, CLEVELAND, OHIO.
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WASHINGTON, Kellogg Building.
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SAN FRANCISCO, John Woodlock, 154-156 First St.

NEWARK IRON & STEEL CO., Newark, Ohio.

Open Hearth Steel Castings, Forge Steel, High Pressure and Hydraulic Fittings, Oil Well Specialties, Castings Made True to Pattern and Uniform.

LONG DISTANCE 'PHONE **358.**
Orders Solicited.
Promptness and Reasonable Prices Our Motto.

Cleveland Union Station.
Pennsylvania Lines
Foot of Bank Street.
TICKET OFFICES at Union Station, Euclid Av. and Woodland Av. Stations.
New City Ticket Office, No. 1 Euclid Av., Cor. Public Sq.
THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
*Daily. †Daily except Sunday.

*Daily. †Daily except Sunday.

From Cleveland to	Leave.	Arrive.
Pittsburg & Bellaire	†7:00 a m	†11:30 a m
Salem & Pittsburg	*8:00 a m	*8:20 p m
Salem & Pittsburg	*4:00 p m	*11:30 a m
Philadelphia & New York	*4:00 p m	*11:30 a m
Baltimore & Washington	*4:00 p m	*11:30 a m
Pitts., Bellaire & East	†1:40 p m	†6:30 p m
Baltimore & Washington	†1:40 p m	†6:30 p m
Ravenna & Alliance	*5:00 p m	*8:10 a m
Philadelphia & New York	*11:30 p m	*5:00 a m
Baltimore & Washington	*11:30 p m	*5:00 a m
Pittsburg & Wellsville	*11:30 p m	*5:00 a m

Mt. Vernon & Pan-Handle Route

From Cleveland to	Leave.	Arrive.
Akron, Columbus & Cin	*8:10 a m	*5:50 p m
Indianapolis & St. Louis	*8:10 a m	*5:50 p m
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CHROME ORE, Blackwell's Special Refractory Quality.
CHROME BRICKS, MAGNESITE BRICKS, } THE "Matchless Brand."
MAGNESITE CALCINED, Lump and Ground, and Cement.

FERRO-PHOSPHORUS, Lion Brand, Increases Heat, Enriches Slag.
LION BRAND SAM ALLOY, THE DEOXIDIZER.
CALCIUM FLUORIDE (Fluor Spar) THE Desulphurizer.

Geo. G. Blackwell, Sons & Co., Limited, The Albany, Liverpool, Eng.

MANUFACTURERS, METALLURGISTS, MINE OWNERS, MERCHANTS.
WORKS: Garston Docks. CODES: A. B. C., Moreing & Neal, Leibers, and Western Union.

THE BASSETT-PRESLEY COMPANY,
IRON & STEEL.
CLEVELAND, OHIO.
Try our celebrated CROWN IRON—3-8 in. to 2 in. carried in stock.

THE UNITED COKE & GAS COMPANY,
277 BROADWAY, N. Y.

COMPLETE COKE AND GAS PLANTS INSTALLED.

SPECIALTIES: Coke Ovens with and without Saving of By-Products.

BY-PRODUCT OVENS NOW IN COURSE OF ERECTION:

Lackawanna Iron and Steel Co	Lebanon, Pa.	232 Ovens.
Lackawanna Iron and Steel Co	Buffalo, N. Y.	564 "
South Jersey Gas, Electric and Traction Co.	Camden, N. J.	100 "
Maryland Steel Co.	Sparrow's Point, Md.	200 "
Michigan Alkali Co	Wyandotte, Mich.	15 "
Sharon Coke Co.	Sharon, Pa.	212 "

TROPENAS STEEL PROCESS

With one 2-Ton Converter, makes Castings from 1 oz. to 10,000 lbs.

Sole Agents: **POWELL & COLNE,** 11 Broadway, NEW YORK

AVERAGE OF 22 TESTS MADE BY U. S. COVERNMENT.

Sulphur .035%. Ph. .050%.
Elastic Limit 34374. Tens. Strength 67722.
Elongation 33, 36%. Reduct. of Area 46, 4%.
Bent Cold 186 Degrees as Above.

11 PLANTS IN U. S. AND CANADA.

American Malleable Iron Co.

Marquette Building, Chicago.

CAPACITY: 20,000 Tons Annually.

PROMPT DELIVERIES.

WORKS: Chicago Highlands, Ill.

High Grade Malleable Castings of all kinds.

MALLEABLE

Buhl Malleable Co.
DETROIT, MICH.

CASTINGS.

H. C. FRICK COKE CO.

Post Office, PITTSBURG, PA.

PRODUCERS OF

CONNELLSVILLE COKE.

Mines and Ovens in the Connellsville Coke Region, Penna.

Direct Connections with all Railroads Entering the Region.

BESSEMER COKE COMPANY,

Manufacturers of

CONNELLSVILLE COKE,

Furnace, Foundry and Crushed Coke.

Mines and ovens in Connellsville region.

Direct connections with all the railroads entering the region.

OFFICES: LEWIS BLOCK, PITTSBURGH, PA.

CAPACITY, 100 CARS DAILY. INDIVIDUAL CARS.

FORGINGS

For All Possible Purposes.
Made as they should be.

CRAWSHAW & JUDD,

51 UNION STREET,

WORCESTER, MASS.

Strictly Chemically Pure Acids and Aqua Ammonia,

ESPECIALLY ADAPTED TO LABORATORY WORK.

MANUFACTURED BY

THE GRASSELLI CHEMICAL COMPANY,

General Office and Principal Works, CLEVELAND, O., U. S. A.

STOCKS AT

Tremley, N. J., New York Office, 62-65 Wall Street.
St. Louis, Mo. Cincinnati, O. Milwaukee, Wis. St. Paul, Minn.
Beaver Falls, Pa. East Chicago, Ind. Birmingham, Ala.
Philadelphia, Pa.: Wm. M. Wilson's Sons, 225 Dock Street.
New Orleans, La.: The Grasselli Chemical Co., Godchaux Bldg.
Chicago, Ill.: James H. Rhodes & Co., 42-44 Michigan Ave.

McLANAHAN-STONE MACHINE CO.,

(Gaysport Foundry),

HOLLIDAYSBURG, PA.

Entire Outfits for Washing and Dressing Ores and Phosphates at least cost.

Improved washers with steel or wood logs. Screens, cylindrical and conical of all descriptions. Steel slow moving elevators and conveyors. Picking Belts for coarse material and hard usage. Friction Hoists. Single Roll Crushers for rough crushing in large quantities.

CASTINGS OF EVERY DESCRIPTION, ESPECIALLY HEAVY ONES.

PROTECT

From Rust, Fire, Sun, Water and Weather by using our products. . .

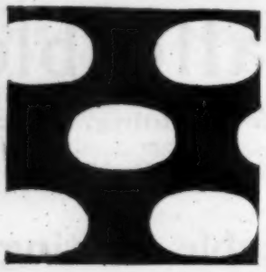
Pure Red Lead

Kept from settling by our **Double Oxygenized, Pure Linseed Oil.**

The National Fireproof Paint Co.
40 Dearborn St., Chicago, Ill.

DEPARTMENT "B"

"We will appreciate your inquiries."



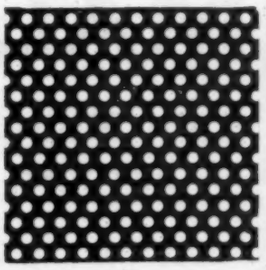
"AITCHISON
Makes 600
VARIETIES."

THE ROBERT AITCHISON PERFORATED METAL CO.
303 Dearborn St., CHICAGO.

Perforated Metals

FOR

Mining and Agricultural Machinery, Thresher Sieves, Fanning Mill Riddles, Separator Screens, Corn Cleaners, Etc.



PERFORATED PLATE SCREENS
AS REQUIRED FOR
Stone, Ore, Zinc, Lead, and all Railroad and Mining Uses.
SPECIAL SCREENS FOR COAL AND COKE.
HENDRICK MFG. CO.,
Samples and information upon request. Carbondale, Pa.

Allis-Chalmers Co.,
CHICAGO.

Perforated Plates

for Incline Shaking and Revolving Screens for Coal Washing and Cleaning, and all other purposes.

Write for Prices.

THE CHICAGO SCREW CO.
SET, CAP and MACHINE
Hexagon Nuts, Studs, Etc. **SCREWS.** Coupling Bolts Specials.
No. 2 N. Canal St., - - CHICAGO.

"THE NUT THAT STAYS"

The Elastic Self-Locking Steel Nut

It goes on the bolt with a slight grip that holds it from ever working loose like the ordinary nut, and requires no nut-lock or other fastening to hold it. For use on Cars, Track, Bridges, Machinery, etc., where nuts must stay it is greatly superior to the common iron nut and costs less. Our Elastic Nut Track Bolt makes the best and cheapest rail fastening. Write us for booklet, samples and prices on Sq. and Hex. Nuts, Machine Bolts, Track Bolts, Structural Rivets, etc. Address
NATIONAL ELASTIC NUT CO., Milwaukee, Wis.

CRANE FITTINGS
ESTABLISHED 1855

PENTON'S FOUNDRY LIST.

A complete list of founders in United States and Canada. Price $10.00.

Furnished by THE IRON TRADE REVIEW, CLEVELAND, O.

The "ORIGINAL GANDY"
STITCHED COTTON DUCK BELTING.

Especially adapted for Main Drivers, Saw Mills, Cotton Gins, Cotton Presses, and for all places where belts are subjected to moisture or atmospheric changes, the "GANDY" stands paramount.
For further information, prices, etc., write
THE GANDY BELTING CO., Baltimore, Md.

PATTERNS FOR CASTINGS.

Our experience has taught us that the trade appreciates fair dealing and meritorious articles, and on this basis we stand. We can give you satisfaction.

THE BALKWILL PATTERN WORKS,
970-972 HAMILTON STREET,
CLEVELAND, OHIO.

WE MAKE
NOTHING BUT PATTERNS

Our business is not a mere side-show to something else, so your ideas are not likely to be appropriated before you see them embodied in your own machines. We have never allowed anyone, not an employe, inside our shops. Some curious things are happening in the pattern business. *Remember the owl.*

THE GOBEILLE PATTERN CO.,
Largest Pattern Works in the World,
CLEVELAND, O.

IMHAUSER'S WATCHMAN'S TIME DETECTORS
THAT CANNOT FAIL.

Highest Award Pan-American Exposition.

Made with 12 or 24 different keys. Contain all the modern improvements. Warranted in every way Cannot be tampered with, without detection.

Manufactured by
E. IMHAUSER & CO.
Write for catalogue.
206 BROADWAY, N. Y.

A. M. CRANE & CO., Inc.
THE ROOKERY, CHICAGO. 74 BROADWAY, NEW YORK.

Foreign Structural Steel, Billets, Sheet Bars—Prompt Shipment.

Rods, Plates, Angles, Sheets, Bars.

Rails, Track Bolts, Spikes.

Machine Bolts, Rivets.

Gray Iron and Steel Castings.

Canton Steel Roofing Co.

Canton, O.

CORRUGATED ROOFING,
CURVED ARCHES,
METAL CEILINGS.

Heavy Eave Trough and Conductor Pipe.

WRITE US

GIRARD, OHIO. GIRARD BOILER & MFG. CO.

The Meehan Boiler & Construction Co.,
Lowellville, Ohio.

MANUFACTURERS OF

Water Tube Boilers, Blast Furnaces, Pipes, Tanks and Plate Iron Work of Every Description.

THE ENTERPRISE BOILER COMPANY, Youngstown, Ohio.

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